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DEPARTMENT OF THE ARMY FIELD MANUAL

ENGINEER TROOP ORGANIZATIONS AND OPERATIONS

HEADQUARTERS, DEPARTMENT OF THE ARMY

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ENGINEER TROOP ORGANIZATIONS AND OPERATIONS

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CHAPTER 1
ENGINEER TROOP ORGANIZATIONS

Section I. INTRODUCTION

1. Purpose

This manual presents the basic doctrine governing the activities of engineer troop units in a theater of operations. Its purpose is to assist commanders and their staffs in the employment and supervision of such units. The general information on Engineer operations and employment found in the FM 100- and 101-series has been expanded and incorporated into this manual and is applicable without modification to both nuclear and nonnuclear warfare. These guidelines, when combined with experience, judgment, initiative, and imagination, will enable the commander to utilize best the capabilities of the engineer forces.

2. Scope

This manual covers both Engineer troop organizations and operations. Engineer commanders and their staffs, and staff engineers and their sections are dealt with fully. The manual covers the units, their assignments, and their employment in offensive and defensive operations in both the forward and rear areas in a theater of operations. Throughout the manual, doctrine rather than technique is stressed. Flexibility in the employment of Engineer units, rather than adherence to rigid rules, is likewise emphasized as the best means for successfully accomplishing the missions.

3. Appendixes

Appendix I consists of a list of references to related publications. Appendix II is composed of pertinent extracts from the tables of organization and equipment (TOE's) of engineer troop units.

4. Recommended Changes

Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text to which they refer. Reasons should be provided for each comment to in-

sure understanding and thorough evaluation. Comments should be forwarded directly to the United States Army Engineer School.

Section II. UNIT CLASSIFICATIONS

5. Introduction

The branches of the Army are grouped into arms and services. The arms are those branches whose primary mission is combat and combat support, and the services are the other branches. Some branches have essential missions in both fields. The Corps of Engineers is an arm having essential missions in both fields. Engineer units are divided into three categories (I, II, and III) by mission and organization.

6. Category I Units

a. Definition. Category I units are units organized under tables of organization and equipment whose missions include the seizing and holding of ground, in addition to that of destroying the enemy, and their corresponding headquarters and service companies, together with units whose missions include destruction of the enemy in support of, or assistance to, the ground gaining troops by fire or other tactical support. These units operate habitually in the forward portion of the active combat area.

b. Engineer Responsibility. Category I units operate in support of major units whose primary mission is the destruction of the enemy forces. These Engineer units are specifically trained, organized, and equipped to fulfill their combat type missions by construction and destruction. Table I gives examples of Engineer units to this category.

7. Category II Units

a. Definition. Category II units are units organized under tables of organization and equipment whose missions include support and assistance of a nontactical nature to category I units in the forward active portion of the combat area. They are found habitually forward of the army rear boundary and are normally assigned to division, corps, or army.

b. Engineer Responsibility. Category II units furnish engineer support within the corps and army forward areas to the tactical commanders. These units are trained to accomplish a wide variety of engineer tasks and to support both category I Engineer units in the performance of a particular engineer task and field army in supporting the overall combat effort of the army. Table I gives examples of engineer units in this category.

Table I. Engineer Unit Classification

Classification	Divisional	Nondivisional	Construction	Intelligence mapping and geodetic	Maintenance and supply
Category I	Armd Div Engr Bn Inf Div Engr Bn Abn Div Engr Bn	Engr Amph Spt Cmd Engr Cmbt Bn			
Category II	----------	Hq and Hq Co Engr Bde Hq and Hq Co, Engr Cmbt Gp Lt Eqp Co Panel Bridge Co Float Bridge Co	Hq and Hq Co, Engr Const Gp Const Bn Pipeline Eqp Co Engr Co Redstone Const Spt Co	Topo Bn, Army Topo Co, Corps	Sup Pt Co Water Sup Co Engr Maint Co (DS)
Category III	----------	----------	Dump Truck Co Port Const Co	Camouflage Bn Base Topo Bn	M and S Gp Depot Bn Depot Co Hvy Maint Co Parts Depot Co

8. Category III Units

a. Definition. Category III units are units organized under tables of organization and equipment whose missions include service and operations in support of a combat area and the operating agencies of a communication zone. These units are found normally in the communication zone or along the lines of communication leading thereto, to include the continental United States.

b. Engineer Responsibility. Category III units furnish maintenance and logistical support for forward units, and provide engineer support in the construction of rear area installations. Table I gives examples of engineer units in this category.

Section III. ORGANIZATIONS

9. Large Commands

a. Brigades. The engineer brigade consists of a brigade headquarters and headquarters company to which construction, combat, equipment, maintenance, and supply units are attached as required. The brigade is used when the control of a large-scale engineer operation demands a single engineer command.

b. Engineer Amphibious Support Command (EASC).

(1) The EASC is designed to furnish specialized support to Army forces engaged in assault landing operations involving landings on a hostile shore. Typical of such assault landing operations are the amphibious assault and shore-to-shore crossings of sea areas and inland waters which require support in landing areas and/or interim logistical support of assault forces. The EASC landing support capability is particularly suited to assaults involving surface landing means and is adaptable to support of the related air landing assault elements of the landing force.

(2) The EASC consists of a headquarters and headquarters company, a service support battalion, an engineer amphibious battalion, an amphibious signal battalion, and the necessary engineer amphibian equipment battalions.

(3) The EASC planning staffs provide special staff advice and assistance to commanders at field army, corps, and division levels in the development of operations plans for assault landings on hostile shores.

(4) Amphibian vehicles organic to the EASC are sufficient for command and control needs and to provide a surface landing capability for landing the assault elements of three battle group landing teams. Alternatively, the am-

phibian vehicles are used in support of shore party functions.

10. Groups

Groups resemble the brigade both in concept of organization and in operations. They have an organic headquarters and headquarters company, and become operational through the attachment of other units. Groups may contain several battalions, separate companies, and teams. There are three types of engineer groups:

a. Combat.

b. Construction.

c. Maintenance and Supply.

11. Battalions

Engineer battalions may have a fixed or flexible organization. Generally they consist of a headquarters, a headquarters company, operating companies (line), and support companies. Regardless of the organization specified in a battalion's TOE, the battalion may be augmented by the temporary attachment of other Engineer units. The battalion headquarters company has its own company headquarters, and is charged with the administrative and housekeeping responsibilities for the personnel of battalion headquarters; in addition it may contain one or more platoons which support or supplement the operating or line companies by performing specialized services. Operating or line companies normally consist of a company headquarters, headquarters platoon, and two or more operating platoons. The companies may be identical, as in the Infantry Division Engineer Battalion; all different, as in the Army Topographic Battalion; or a combination, as in the Armored Division Engineer Battalion. There are five types of engineer battalions:

a. Combat.

b. Construction.

c. Camouflage.

d. Topographic.

e. Maintenance and Supply.

12. Separate Companies

These units are not organic companies of a battalion, but are commonly attached to an engineer command headquarters. It is possible, however, under certain conditions, to find them operating independent of a higher engineer troop command. A separate company normally consists of a company headquarters, head-

quarters platoon, and two or more operating platoons. These platoons may be identical, as in the Engineer Panel Bridge Company; or all different, as in the Engineer Topographic Company, Corps; or a combination, as in the Engineer Light Equipment Company. A platoon may be divided into two or more sections or squads, or may not be divided at all. The headquarters platoon contains the supervising and housekeeping personnel, and may have one or more sections which support the operating elements by furnishing specialized services. The six separate type companies are—

a. Bridge.

b. Equipment.

c. Special Construction.

d. Topographic.

e. Maintenance.

f. Supply.

13. Teams

a. General. The Engineer Service Organization (TOE 5–500) provides cellular units of specialized teams of varying sizes, functions, and capabilities for use when standard organizations are too large or cannot meet the particular engineer needs of the theater. The team organization permits variety and flexibility with maximum use of manpower and equipment. Teams may be combined to form a composite platoon, a company, battalion, or group, depending upon the nature and/or scope of the mission. Individual teams may be attached to an engineer unit to increase the unit's capabilities, or occasionally to units of other arms or services. Teams fall into the following seven classes:

(1) *Administrative and headquarters.*

(2) *Supply.*

(3) *Maintenance and parts.*

(4) *Firefighting.*

(5) *Equipment operating.*

(6) *Construction, utilities, and electrical power.*

(7) *Topographic, geodetic, and intelligence.*

b. Characteristics. Teams have the following characteristics:

(1) They comprise a group of individuals trained to work together as specialists in some particular field.

(2) They may perform certain operations as a unit; comprise a specialized cadre around which a larger organization

is built; or act as individual inspectors, instructors, or supervisors.

(3) Their equipment is generally restricted to the transportation and tools and supplies related to their specialty.

(4) They are not self-sufficient in respect to such matters as administration, shelter, messing, supply, storage facilities, signal communications, and medical service. For such support they must rely on the organization to which they are attached.

(5) Some teams consist of only a handful of specialists, while others, such as certain topographic teams, are small-scale replicas of corresponding larger units.

Section IV. MODIFICATION OF UNITS

14. Augmentation

a. TOE Authority. The TOE's of some units, e.g., the Engineer Construction Battalion, authorize an increase in both equipment and personnel for the performance of certain specified tasks. In addition, specified additional items of equipment are allowed, when authorized by a higher command, e.g., the theater of operations commander (WAB TOC), or the U.S. Continental Army Commander (WAB USCONARC).

b. Other Authority. The capabilities of a unit may be increased through direct-hiring, straight labor contracts, construction contracts, attachment of elements of allied armies, or the assignment of prisoners of war. Equipment augmentation alone may be made through such authority as equipment modification lists (EML), or on a temporary loan basis.

c. Special Considerations.

(1) Since supplemental labor is seldom trained or skilled in the precise job to which it will be assigned, increased supervisory and inspection responsibilities fall upon the supplemented unit (usually falling to U.S. personnel who are normally equipment operators or other type specialists).

(2) Lack of familiarity with U.S. equipment by supplemental labor will normally cause a sharp increase in the maintenance workload.

(3) Supplementation also normally requires considerable non-Engineer support such as food, transportation, and gasoline. In the same way, considerable supplementary Engineer support in the form of construction materials,

shelters, solid fuels, construction equipment, and tools, is also usually needed.

(4) Supplementation of a unit by any of the above means does not necessarily result in a corresponding proportional rise in the supplemented unit's work output.

15. Reduced Strength and Type B Units

a. Reductions.

(1) *TOE authority.* If a unit is to be utilized at a strength less than that required for the performance of its normal function, on a sustained basis in an active theater of operations, the nature and extent of the authorized reduction is set forth in the *reduced strength* (RS) column of the TOE.

(2) *Types.* A reduction may be horizontal, vertical, or both. A horizontal reduction involves an across-the-board deletion of selected individual personnel and their equipment, and individual items of equipment. A vertical reduction is the entire deletion of one or more components, such as a complete platoon or company.

(3) *Special considerations.* The decision to make either a horizontal or a vertical reduction depends upon the anticipated mission of the unit involved. A horizontal reduction maintains an evenly distributed, though reduced, engineer support. A vertical reduction, while enabling concentrated effort, precludes such effort being evenly distributed.

b. Type B Units. These units consist of the minimum U.S. personnel necessary for command, supervision, administration, technical assistance, and specialized maintenance. They are augmented with non-U.S. personnel who fill the nonkey positions. Such units are normally employed in rear areas only. When a unit is organized as a type B unit and augmented to full strength with indigenous personnel, it has a reduced capability when compared to that of a full-strength unit.

CHAPTER 2
STAFF ENGINEERS AND ENGINEER DIVISIONS OR SECTIONS

Section I. THEATER ARMY

16. Engineer

a. The theater army engineer is the planner, supervisor, and coordinator of all Army engineer activities within the theater. He provides information and technical advice for the commander and the general and special staffs, keeping them constantly informed of the condition, capabilities, and requirements of those elements of his service which are assigned to the command. The theater army engineer coordinates the overall stock control; maintenance and construction programs; the devising of uniform methods of administrative procedure for his service; development of new, improved, or specialized types of supplies to meet the needs peculiar to the theater; formulation of training policies for his service; and the estimates of requirements and recommendations for procurement and distribution of the supplies and services pertaining to his service. He develops the commander's decisions into operational plans for his service and is responsible for producing engineer intelligence.

b. The theater army engineer does not command the Engineer troops of lower echelons. He does exercise technical supervision over his service as a whole. Engineer operational plans that affect lower echelons are issued through command channels only, and thus are normally part of the plans of the commander. To insure proper execution of these plans, the theater army engineer makes such technical inspections and requires such reports as are necessary.

17. Deputy

The theater army engineer has as his principal assistant a deputy who is his main coordinating agent and adviser. The deputy supervises and directs the division to insure unified action. He formulates and develops policies for the general operation of the division, and represents the theater army engineer in that officer's absence.

18. Engineer Division

(fig. 1)

a. Personnel and Administration Branch. The personnel and administration branch maintains the central and classified files, prepares and supervises internal office moves, and allocates office space and transportation for the branch; operates the message center and prepares the administrative regulations of the branch; supervises and coordinates all reproduction as required by the Engineer division, except the reproduction of maps and surveys, which is the responsibility of the intelligence and mapping branch. In addition, it coordinates with theater army G1 on personnel policies and requisition of Engineer personnel, and coordinates with the Theater Army Replacement and Training Command to insure an adequate flow of qualified personnel to the Theater Army Logistical Command (TALOG) and to army group engineer units and headquarters. It determines priorities for assignment of critically needed specialists between TALOG and army group.

b. Intelligence and Mapping Branch. The intelligence and mapping branch assists and advises the Army Engineer, and other staff agencies on matters pertaining to the planning and execution of the engineer intelligence and mapping programs; prepares mapping and engineer intelligence appendixes to OPLANS and con-

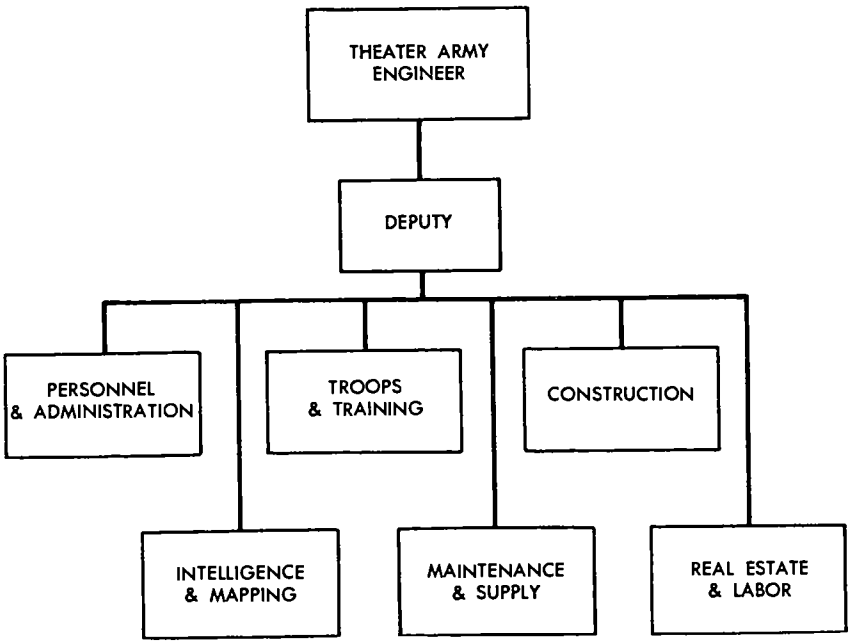


Figure 1. Typical theater army engineer division.

tingency plans; provides guidance and staff supervision for geodetic, mapping, engineer intelligence, and military geology activities within the theater in conformance with policy established by the Department of the Army, and theater G2; maintains liaison with higher, lateral, and lower commands on requirements concerned with geodesy, procurement of mapping photography, production, reproduction, and distribution of maps, engineer intelligence, and military geology; promulgates policy on all technical aspects of mapping and engineer intelligence activities, including required facilities, troop bases, production specifications and techniques; promotes, develops, and exploits cooperative mapping agreements with friendly foreign nations in the theater area of interest and furnishes technical advice and assistance to topographic agencies of these countries; and maintains the theater engineer intelligence and map reference library.

c. Troops and Training Branch. The troops and training branch determines requirements for the distribution of engineer troops in the theater and recommends the initial assignments of units to the Army engineer and studies the adequacy of units and equipment for current and future operations. It prepares recommendations for new or revised engineer unit TOE's, develops logistical data on operational capabilities of engineer units and equipment; prepares engineer operational reports and prepares and distributes special engineer training literature and training aids; maintains liaison with higher echelons and with allied forces on matters pertaining to engineer training and engineer schools, and formulates engineer schools' policies; keeps data on strength, composition, assignment, and station of all engineer units in the theater; maintains contact with allied forces and other sources on new techniques and developments; and plans and coordinates all theater firefighting activities.

d. Maintenance and Supply Branch. This branch of the theater army engineer division prepares plans for and makes recommendation to the Army engineer as to the levels of supply of class II and IV Engineer materials and certain Ordnance class V materials within the theater, and advises the Army engineer as to policies regarding procurement, storage, and issue of engineer supplies, equipment, and materials. In coordination with the intelligence and mapping branch it assists in formulating policies regarding inspection, collection, and use of captured engineer supplies, and prepares and distributes technical instructions concerning the plans for destruction of engineer equipment or supplies which might be subject to capture or abandonment. It is responsible for the logistical planning at theater level to insure

a continuous and adequate flow of engineer supplies and equipment, and assists in formulating policies regarding maintenance and repair parts support of engineer equipment.

e. Construction Branch. The construction branch of the theater army engineer division advises the Army engineer on the scales of accomodation for troop housing and design standards for construction. It determines construction requirements to support present and future operations in the theater in coordination with G4 and the engineers of army, army-group, and TALOG. It provides staff supervision of construction planning and construction operations of subordinate commands.

f. Real Estate and Labor Branch. This branch of the theater army engineer division advises the Army engineer as to the operating procedures for the procurement of all real estate and civilian labor, and the requirement and allocation of same. It exercises technical supervision over lower echelons for procurement of real estate and labor.

Section II. THEATER ARMY LOGISTICAL COMMAND (TALOG)

19. Engineer

Logistic support of the entire theater is based upon the ability of TALOG to discharge effectively the logistical functions in accordance with policies established by theater army. When such factors as the configuration of the communications zone, or the complexity of the operation, require it, the communications zone may be divided, with the TALOG commander delegating territorial responsibility to advance logistical command (ADLOG) commanders and base logistical command (BALOG) commanders. (See FM 54–1 for details of organization, employment, and operations of TALOG and subordinate logistical commands.) The TALOG engineer is charged with supervising, planning, and coordinating all engineer operations in the communications zone and performing those operational duties assigned by higher headquarters. The TALOG engineer functions as the staff adviser on engineer matters to the TALOG commander, and, when applicable, recommends assignment of engineer missions to the subordinate logistical commands. In many circumstances, the creation of a TALOG engineer force for selected employment will be advantageous.

20. Executive Officer and Deputies

a. The TALOG engineer has as his principal assistant an executive officer who is his main coordinating agent and adviser;

essentially, he performs the same duties for the TALOG engineer as does the deputy theater army engineer for the theater army engineer.

b. Further augmenting the office of the TALOG engineer may be two more assistants, a *Deputy for Plans* and a *Deputy for Operations*. Both deputies work closely together since the majority of their functions overlap, necessitating their functioning as an entity.

(1) The deputy for plans is responsible to the TALOG engineer for all future planning affecting the engineers. He supervises, and coordinates with the appropriate branches, the preparation of future troop, maintenance, real estate, utilities, and labor requirements. He is also responsible for the preparation of the engineer estimate and engineer portion of the base development plan, the engineer annex to the TALOG operation plan and order, and the TALOG administrative plan and order. He normally assists in the preparation of the engineer portion of the rear area security and rear area damage control plans for the communications zone.

(2) The deputy for operations is mainly interested in current, day-to-day operations and coordination of the division. He supervises the inactivation or conversion of engineer units; execution of special nonroutine investigations and reports; and coordination of construction operations with construction supply activities.

21. Engineer Division

(fig. 2)

The engineer division is composed of the following branches:

a. Personnel and Administration Branch. The responsibilities of this branch correspond to the responsibilities of the personnel and administration branch of the theater army engineer division, so far as they pertain to TALOG.

b. Intelligence and Mapping Branch. The intelligence and mapping branch compiles, processes, and disseminates engineer intelligence pertaining to the logistical phase of proposed operations. In cooperation with troops and training branch, it compiles and disseminates information on engineer techniques and equipment, including those of the allied forces and the enemy. It controls and directs the procurement, storage, and distribution of maps, operates the map library, supplies maps to staff divisions of the headquarters, and maintains an engineer intelligence library. It exercises staff supervision over operations of engineer technical intel-

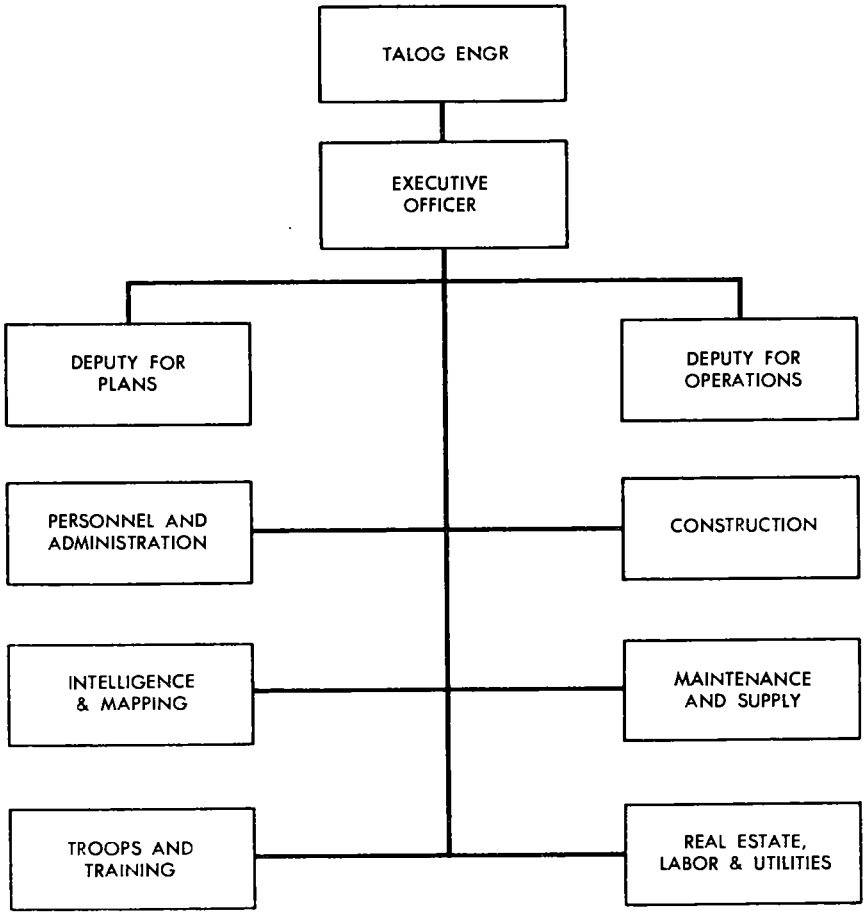


Figure 2. Typical TALOG engineer division.

ligence teams and security units assigned or attached to TALOG, supervises the shipment of all new items of captured enemy engineer equipment through normal supply channels to the U.S. Army Engineer Research and Development Laboratory; prepares procedures for handling classified documents and material; and supervises and inspects the internal security of the engineer division.

c. Troops and Training Branch. This branch recommends assignment of engineer units in COMZ and continually studies the adequacy of units and equipment for current and future operations, and determines requirements for engineer troops in COMZ for current and future operations. It supervises and coordinates TALOG engineer troops movements; is responsible for the preparation of the engineer portion of the rear area security and rear area damage control plans; supervises and coordinates the train-

ing of TALOG engineer troops and the organization and operation of a theater level specialist school; maintains liaison with the theater army engineer on training and quotas for attendance at engineer schools; prepares periodic disposition reports, engineer operational reports, engineering training policies, standards tests, and general directives for engineer troops in COMZ. It assembles data and prepares the historical report of the engineer division.

d. Maintenance and Supply Branch. This branch of the TALOG engineer division supervises operation of the theater wide engineer maintenance and supply management system. It is the central office of record. It recommends the location and type of engineer maintenance and supply establishments; consolidates the requirements for engineer supplies for the theater and procures engineer supplies in conformance with stock levels and issue policy established by theater army; exercises control over the issue or rationing of critical engineer items in short supply, in accordance with theater policies; recommends procedures for control and allocation of engineer supplies in cooperation with other branches of the engineer division; prepares requirements for and instructions for storage and issue of repair parts; and prepares instructions for disposal of engineer salvage. In coordination with the intelligence and mapping branch, it conducts research for new sources of engineer supplies. It prepares technical instructions governing storage and issue and maintenance of engineer supplies and equipment; arranges for transportation for all engineer supplies; recommends changes in property-accounting procedures; prepares plans for the forward or rearward displacement of depot stocks; recommends assignment of engineer units and personnel required to handle supplies and conduct necessary maintenance; and inspects engineer supply and maintenance installations and units for their compliance with policies and instructions regarding engineer supplies. It prepares logistical plans at TALOG level to insure a continuous and adequate flow of engineer supplies and equipment to support present and future operations in the theater. It recommends supply levels for subordinate units of TALOG.

e. Construction Branch. This branch determines detailed requirements of construction material for known and anticipated construction projects within the communications zone; recommends allocation of engineer construction troops to permit maximum use of civilian and PW labor; provides a staff of experienced engineers for consultation on special engineering problems; compiles and publishes statistical data and maintains records showing progress on all construction activities. It prepares plans for future TALOG construction in accordance with data provided by the

TALOG coordinating staff. In accordance with approvals and priorities established by TALOG, and theater and theater army policies, it prepares detailed plans and provides, by rehabilitation or new construction, all installations required in COMZ by U.S. field and service forces.

f. Real Estate, Labor, and Utilities Branch. This branch prepares procedures, standards, and plans for the procurement and utilization of real estate in conformance with policies of higher headquarters; prepares procedures, standards, and plans for the maintenance of real estate records; supervises the utilization of real estate; supervises and coordinates repairs and utilities activities in COMZ and prepares policies, procedures, standards, and plans for these activities. It supervises and coordinates all TALOG fire prevention and firefighting activities and prepares and publishes policies and programs for fire prevention and the firefighting activities in COMZ; and supervises the procurement, utilization and administration of indigenous labor for engineer units in conformance with policies of higher headquarters.

Section III. FIELD ARMY

22. Engineer

In addition to the special staff functions outlined in FM 101–5, the Army engineer—

a. May perform specified functions of command over designated units when so directed by his commander. Technical service staff officers normally exercise operational control over their specialized activities under authority delegated by the commander.

b. Maintains close contact with and provides necessary support to the corps engineers in the field army.

c. Coordinates all engineer activities for the field army.

d. Guided by G2 policies, establishes army map plans, determines map requirements, and supervises and coordinates all mapping and geodetic activities of the field army; establishes and supervises geodetic information center and map depot system; and provides field army staff with planning maps.

e. Advises and assists the field army commander in planning and utilizing atomic demolition munitions (ADM).

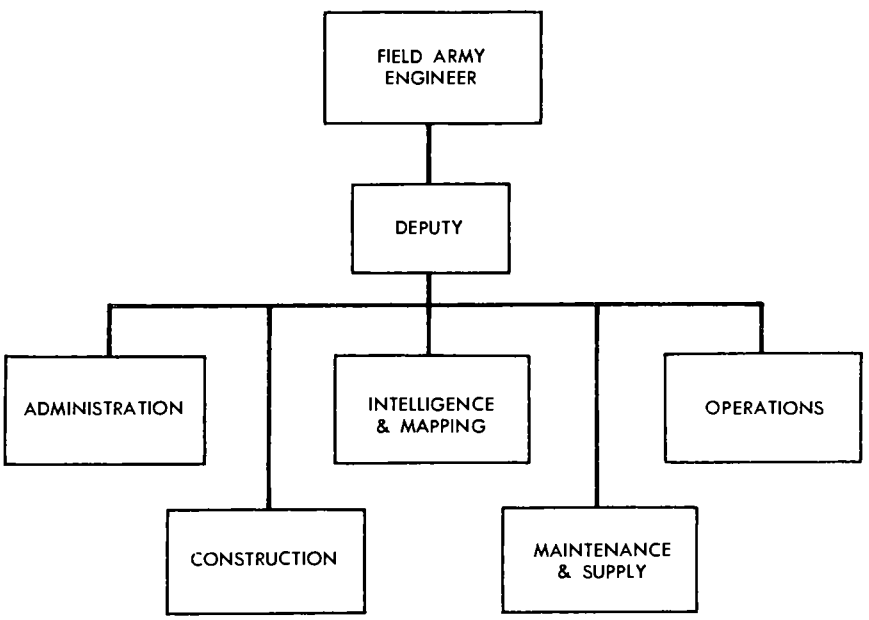
f. Maintains continuous contact with the theater army engineer and the TALOG engineer, calling upon them for assistance as required.

23. Engineer Section

(fig. 3)

a. General. The army engineer section of the army special staff includes, in addition to the army engineer, the army engineer's deputy, an administration branch, an intelligence branch, an operations branch, a construction branch, and a supply branch. In some cases the administration branch is relieved of the responsibility for real estate and a separate branch is provided for that function. The maintenance responsibilities are sometimes set up as a separate branch also. This organization is flexible and can be varied to meet the desires of the engineer. The deputy army engineer acts as the executive officer of the section and acts for the army engineer in that officer's absence.

b. The administration branch includes an administration officer, a real estate officer, a chief clerk with assistant, and a clerical, stenographic, and typing force. It handles personnel matters pertaining to engineer troops, real estate functions (if a separate real estate branch is not established), and miscellaneous adminis-



NOTE: REAL ESTATE AND MAINTENANCE RESPONSIBILITIES ARE SOMETIMES SET UP AS SEPARATE BRANCHES.

Figure 3. Typical field army engineer section.

trative duties; maintains the files for the engineer section and operates the army engineer message center; works closely with G1 and The Adjutant General; and provides a stenographic and typing pool for the engineer section.

c. The intelligence and mapping branch collects and evaluates information, and disseminates engineer intelligence; exercises technical supervision over engineer intelligence and topographic activities of engineer intelligence teams assigned to the field army. It handles all matters pertaining to the preparation, revision, reproduction, and distribution of maps and map substitutes, so far as they pertain to the army engineer's sphere of responsibility, and within the framework of field army policy as enunciated by G2, with whom it works closely.

d. The operations branch includes an operations officer and assistant; a field engineer and three assistants; and enlisted personnel for field inspection and drafting. Working with the other branches, the operations branch is primarily responsible for assembling and drafting army engineer plans and the engineer paragraphs and annexes of army operations orders. It handles all staff matters pertaining to the organization and operation of engineer units in the field army (except construction, maintenance, supply, topographic and intelligence activities) ; supervises training, and prepares training directives; and maintains records pertaining to engineer operations, including unit combat efficiency reports. It works closely with G3 and G4.

e. The construction branch includes a construction officer with two commissioned and one warrant assistants; a utilities officer; an enlisted bridge inspector; and enlisted specialists in construction and construction drafting. The construction branch supervises all engineer construction activities in army, including the installation and maintenance of structures; designs and prepares plans for structures, to the extent that this cannot be handled by corps or division engineers, or the staffs of the construction units; and assists the operations branch in the preparation of orders, annexes, and training directives, so far as they concern construction activities. It works closely with G3 and G4, and the engineer construction units under field army control.

f. The maintenance and supply branch includes a supply officer and two assistants, an equipment maintenance officer, two warrant officer supply assistants, a chief clerk with an assistant, and supply and supply records specialists. Working closely with G4, it determines and recommends policies and accomplishes special staff supervision with respect to engineer maintenance and supply

activities. This includes the activities of the engineer maintenance and supply group in regard to determining requirements for engineer supplies and controlling those supplies.

Section IV. CORPS

24. Engineer

In addition to the staff functions outlined in FM 101–5, the corps engineer—

a. May perform specified functions of command over designated units when so directed by his commander. Technical service staff officers normally exercise operational control over their specialized activities under authority delegated by the commander.

b. Maintains close contact with, and provides necessary support to, division engineer units and other engineer units not under his operational control.

c. Recommends priorities for allocation of critical and controlled items of engineer supply.

d. Directs and integrates map and engineer intelligence activities with army and theater effort; computes map requirements, reproduces, requisitions, and distributes maps to all assigned and attached corps units; establishes a map depot having limited replenishment stocks, and provides corps staff with planning maps.

e. Maintains continuing contact with the army engineer, calling upon him for assistance when required.

25. Engineer Section

a. The corps engineer section resembles the army engineer section, but is much smaller, and is primarily concerned with tactical operations. The corps engineer has a deputy who is his executive officer and who acts in his absence. (As in the case of the army engineer section, the following organization can be varied to fit particular situations.)

b. Administration subsection, with an administration officer, an enlisted chief clerk, and clerical assistants.

c. Intelligence subsection, with an intelligence officer and enlisted assistant. This subsection works closely with the corps intelligence teams and the corps topographic company.

d. The operations subsection, with an operations officer and two enlisted assistants specializing in combat construction.

e. The maintenance and supply subsection, with a maintenance and supply officer, an engineer supply warrant officer, an equipment maintenance specialist, and two supply specialists. Even though corps is not in the chain of supply the corps engineer must be familiar with the engineer supply situation in corps and give corps and divisional engineer units all possible help in solving their supply problems. He coordinates requirements and sees that needs for engineer supplies arising from future operations of the corps are anticipated and met. Also, he allocates items in short supply within the framework of corps and army policies.

Section V. DIVISION

26. Engineer

In addition to the staff functions outlined in FM 101–5, the division engineer—

a. Exercises command over his battalion (par. 31).

b. Exercises operational control of all engineer troops attached to the division that are not further attached to a nonengineer command.

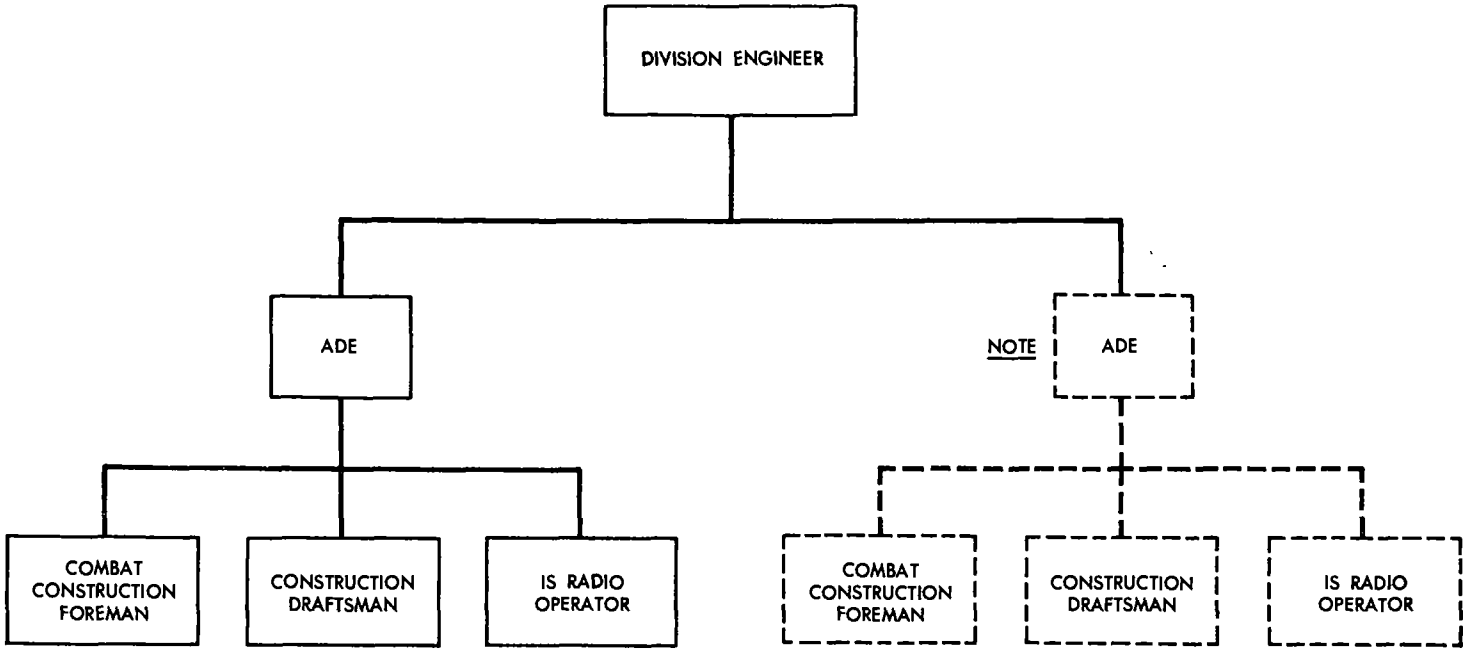
c. Coordinates all engineer activities for the division.

d. Maintains close contact with corps engineer and with commanders and staffs of those corps and army engineer units which are in support of the division.

27. Engineer Sections

(fig. 4)

a. Infantry Division. The division engineer section at division headquarters consists of one assistant division engineer, a combat construction foreman, a construction draftsman, and a radio operator. An identical section is located at infantry brigade headquarters. This provides equal capabilities at both division and brigade headquarters and is necessary because brigade headquarters functions not only as an alternate division headquarters but frequently commands a large portion of the divisional combat power. The assistant division engineers represent the division engineer at the division and brigade headquarters and, when necessary, make decisions for him. The assistant division engineers must familiarize themselves with all pertinent division activities. They are responsible for keeping the engineer situation maps at division and brigade headquarters accurate and up to date. They keep the engineer battalion headquarters informed



NOTE: INFANTRY DIVISION ENGINEER BATTALION ONLY.

Figure 4. Typical division engineer section(s).

of the activities and plans of the division and brigade headquarters.

b. Armored and Airborne Divisions. The armored and airborne divisions each have one division engineer section with an additional radio operator authorized in the armored division engineer section.

28. Consideration of Dual Role of Division Engineer

a. The division engineer should divide his time between division headquarters, other units, and his battalion in accordance with the requirements of the situation and the desires of the division commander.

b. The division engineer should locate his battalion headquarters where he can best direct and control the operations of his subordinate units and where communications between the division headquarters and the battalion headquarters can be maintained.

CHAPTER 3
ENGINEER COMMANDERS AND THEIR STAFFS

Section I. GROUPS AND BRIGADES

29. Commander

The commander of a group or brigade is responsible for the prompt and efficient accomplishment of the mission. He performs the duties outlined in FM 101–5, so far as they pertain to his command, and he prescribes policies and standards for his command. He performs his duties by planning, timely decisions, and by personal supervision.

30. Staff

Depending upon the type organization there are minor variations in the organization of the staffs. The functions of the staffs of these two commands however, are basically the same as those of any other engineer commander's staff.

Section II. BATTALIONS

31. Commander

The battalion commander performs the duties outlined in FM 101–5, so far as they pertain to his command. He directs, supervises, and controls the activities of all organic and attached engineer troops and their equipment. He prepares plans, policies, and orders. He visits and inspects his troops and activities and conducts personal reconnaissance.

32. Staff

The details of the staff organizations of the different type battalions vary and are outlined in each applicable TOE. Generally, however, they consist of an executive officer, administrative officer, intelligence officer, operations officer, and supply officer, plus additional key staff personnel such as: communications officer, equipment maintenance officer, chaplain, and medical officers.

Section III. COMPANIES

33. Commander

The company commander is responsible for the administration,

operation, training, discipline, and supply of his company. In addition to the duties referenced in paragraph 29, the company commander—

a. When assigned a direct support mission or when attached, aids the commander and staff of the organization he supports in developing plans for the employment of the engineer effort available to the command.

b. Analyzes each task and assigns missions to his subordinate leaders.

c. Supervises the execution of work to see that tasks are carried out properly; correct methods are used; supply of materials is maintained; difficulties are anticipated and provided for; and platoon leaders are given all possible facilities, including personnel and equipment from company headquarters or higher headquarters, to help them execute their assigned work.

d. Inspects tools, equipment, weapons, transportation, and all classes of supply to insure that they are properly maintained, used, or stored. He also makes certain that the mess, supply, communication, administration, and maintenance sections of his company are operating properly.

e. Conducts continuing engineer reconnaissance and reports appropriate information to the headquarters of the unit which he supports, and to his platoons.

f. Provides liaison with, and engineer staff advice for, the unit he supports.

34. Staff

The company commander's staff consists of an executive officer, administrative, supply, mess, communication, and maintenance sections, and in some organizations, an operations section.

CHAPTER 4

ENGINEER SUPPORT IN A TYPICAL THEATER OF OPERATIONS

Section I. INTRODUCTION

35. General

a. The dispersal of tactical and administrative units increase the problem of providing required close engineer support. In less developed areas this requirement demands a large number and variety of engineer units, which in turn necessitates excellent command management and a maximum utilization of equipment and indigenous resources. Support is characterized by centralized control of engineer resources and decentralized execution of engineer operations. At all levels, units have relative autonomy and independence in their operations.

b. Divisions engaged in combat require close supporting engineer combat battalions. Engineer combat groups, habitually operating in the forward areas, provide this close support to the divisions. Frequently engineer construction battalions also operate in direct support of tactical operations. This is particularly true in the execution of barrier and denial operations, road maintenance, and retrograde movements. These units also aid in the preparation of defensive positions in the rear.

c. Since no two theaters of operations have identical requirements, an exact listing of engineer units needed to support the major components of a theater cannot be given. The support listed, and illustrated in figure 5 for these components is representative under average conditions. It is assumed that the theater army command comprises one or more type field armies (a field army having three corps of three infantry divisions and one armored division each), and a fully organized communications zone.

Figure 5. Engineer support for type field army and communications zone.
(Located in back of manual)

36. Mission

a. General. The mission of the Corps of Engineers in a theater

of operations is to render support that will increase the effectiveness of friendly forces, and impede, block, or canalize the maneuver of enemy forces.

b. Specific Missions.

(1) Engineer units participate in all forms of land combat, including advance, attack, pursuit, defense, retrograde movements, airborne, amphibious, and denial operations. In these operations they perform various specialized tasks, alone or in cooperation with other units—such as the destruction, breaching, or passage of obstacles; the creation of obstacles and barriers; river crossings; and employment of atomic demolition munitions. Also, in an emergency they may engage in infantry type combat.

(2) All types of general construction, such as cantonments, depots, warehouses, and hospitals, with their necessary utilities.

(3) Construction, reconstruction and maintenance of roads and bridges; the construction, reconstruction, and major maintenance of military railroads, ports, pipelines, and airbases; the construction and maintenance of airstrips and heliports for army aviation; and the maintenance of inland waterways.

(4) Water service.

(5) Topographic, mapping, and geodetic services.

(6) Demolitions.

(7) Camouflage.

(8) Engineer supply and maintenance of engineer equipment.

(9) Technical assistance to other arms and services.

37. Types of Support

a. Assignment. The command under which a unit normally functions is said to be its *assigned command.* Units in a theater of operations may be assigned to theater army headquarters; to army, corps, or division; to a logistical command; a missile command, or to an independent task force. In addition to such initial assignment there may be further assignment. A unit assigned to TALOG may be further assigned to a subordinate command thereof; a unit assigned to army may be further assigned or attached to an engineer brigade under army. Frequently an engineer unit may be under other than a higher engineer troop commander. In such an instance the unit reports to the commander

to which it is assigned. Normally, this commander will place it under the operational control of his staff engineer.

b. General Support. General support is that which is given to and benefits the supported force as a whole, rather than any particular subdivision thereof.

c. Direct Support. Direct support is that which is given a specific unit. An engineer unit in direct support answers directly the supported unit's request for assistance. Direct support is characterized by close liaison and coordination between the supporting and supported unit and provides effective and rapid utilization of the engineer potential.

d. Attachment. When a unit is temporarily under a command other than its assigned command, it is said to be attached. The unit may be attached for some explicit purpose, such as to receive rations, supply, or administration; but unless this is specified, attachment implies that the command to which the unit is attached has full responsibility for the unit's supply, administration, training, and operations. Responsibility in matters relating to the transfer and promotion of personnel will be retained by the parent unit. While attachment may have certain disadvantages, it may be necessary in cases where it is impractical for the parent unit commander or senior engineer command to exercise effective control, support, and supervision. During periods of attachment it is mandatory that appropriate liaison, exchange of information and organizational, technical, and logistical support be maintained between the assigned command and the attached engineer unit.

e. Work Assignments. Combat and construction units may be assigned work either on an area basis—all engineer missions within specified geographical boundaries, or a task basis—one or more specified missions—or both, as the requirements of a corps or field army for engineer support are more closely related to the size and characteristics of the area, and the resulting nature of the engineer tasks to be performed, than they are to the numbers of personnel and equipment to be supported, or to organizational structure of the corps or army. These assignments are made in such a manner as to facilitate rapid shifting of units and effort, when required.

38. Principles of Support

a. Military engineering in its broadest sense includes some pioneering tasks which can be accomplished by the troops of all arms and services, and every effort should be made to avoid dis-

sipation of the engineer potential on such tasks. Engineer units should be employed on tasks requiring their special engineering skills and equipment. Units should be given tasks in accordance with approved priorities based on their importance to the command as a whole and to its mission.

b. The capacity of an undivided engineer unit for useful output is greater than the sum of the capacities of its parts operating singly and independently. This follows from the fact that engineer organizational and operational concepts are designed for flexibility and economy of operation with much equipment and special skills controlled at battalion and group level. Hence, attachment of components of an engineer unit to another command should be the exception. In most cases, a mission can be completed with the engineer unit in a supporting role.

c. When men know and understand each other's capabilities and limitations they work together more effectively. This maxim applies to an engineer unit and the command it serves. Whenever possible, an engineer unit should be consistently placed in support of the same command.

Section II. ENGINEER SUPPORT FOR A DIVISION

39. General

a. Organic to each type division—infantry, armored, and airborne—is an engineer battalion. These divisional engineer battalions are self-contained units designed to provide a maximum combination of equipment and individual skills for forward engineer tasks. Projects are normally accomplished by combat companies, or, as in the case of the airborne division, by platoons, either in general support, direct support, or attached. These, in turn, may be supported by additional equipment and technical supervision from engineer battalion headquarters, thus enabling them to perform extensive combat engineering tasks. In addition to the combat tasks, the divisional engineer battalion normally provides maps, water, engineer class II and IV supplies, and limited third echelon maintenance. (The airborne division engineer battalion provides water supply and procures and distributes maps. It does not provide engineer maintenance supply services.) The infantry and armored division engineer battalions are 100 percent mobile, whereas, the airborne engineer battalion is only 35 percent mobile. All divisional engineer battalions are trained in ground combat operations and when given additional fire support can independently conduct this type of operation in an emergency. When more than one engineer company is re-

quired in direct support of a battle group or combat command, the division engineer may provide a staff officer to coordinate engineer activities.

b. Organic to the battle group, infantry division, is one engineer platoon which is an element of the headquarters and headquarters company. This engineer platoon is an integral part of the engineer support to the division and increases the combat effectiveness of the battle group through general pioneer tasks, such as the hasty repair of roads, trails, fords, culverts, and bridges, and assists in the construction of simple field fortifications. It assists in the breaching or clearing of obstacles, including minefields. It is capable of emplacing and executing demolitions, assisting in the reduction and destruction of enemy fortifications, and performing limited decontamination. In emergencies, it engages in infantry type combat. It is 100 percent mobile and all of its equipment is air-transportable. When engineer companies are not in support of, or attached to, the infantry division battle group, the leader of this engineer platoon serves as a special staff officer advising the battle group commander on engineer matters.

40. Additional Support

When the engineer tasks exceed the capabilities of the division engineers, either by number or by nature, the division must obtain the support of additional engineer combat units available in the field army.

41. Division Engineer Units

a. Infantry Division.

(1) *Battalion.* Engineer support of the infantry division is provided as dictated by the situation. The support is based on all facts which will affect accomplishment of the mission. These include facts pertaining to environment, resources available, and actual or potential obstacles or opposition to success of the mission. The situation may require the entire engineer battalion in a general support role, providing an engineer company or companies in direct support of each committed battle group or other units, attachment of elements of the engineer battalion to other elements of the division, or a combination of these methods. The plan for employment of the engineer battalion in support of the division tactical operation is devised by the division engineer. The plan provides maximum efficient engineer support

with emphasis on support established in consonance with the division mission for the operation.

(2) *Engineer platoon, battle group.* The platoon is employed in general support of the battle group to which it is organic. However, it may be placed in direct support of an element of the battle group if required by the engineer situation as determined by the battle group commander. In the event an engineer company is in direct support of or attached to the battle group, more and better overall engineer support can be provided by placing this platoon under the operational control of the engineer company or the senior engineer officer supporting the battle group.

b. Armored Division. As in the infantry division (*a*(1) above), engineer support is provided as the situation dictates. The division engineer devises the plan for engineer support based on the tactical situation, the anticipated engineer work to be accomplished during the operation, and the number and types of engineer units available. The plan may include employment of engineer elements in a general support role, a direct support role, or attachment. The method of employment depends on the mission and the capability of the parent engineer unit to control, reinforce, and logistically support the engineer element.

c. Airborne Division. As in the infantry and armored divisions, engineer support is provided as the situation dictates. However, in the airborne assault a portion of the battalion may be required in the development of air-landing facilities. As in combat support to the battle groups of the division, the requirement for troops and equipment for air-landing facilities will be dictated by the situation. Development of these air-landing facilities, if necessary, may vary anywhere from no engineer effort to total engineer effort. In the event the latter case should occur, the division commander will determine priority of engineer effort if additional airborne engineer support cannot be provided. Frequently in the airborne assault an engineer platoon is attached to each committed battle group: but again, this is contingent upon necessity. In those cases where the situation in the area of operations is unknown it is considered advisable to effect this attachment. As the situation permits, however, the engineer should attempt to regain control of all of his elements. The guiding principles for general and direct support apply as appropriate.

Section III. ENGINEER SUPPORT FOR TYPE CORPS AND FIELD ARMY (IN ADDITION TO DIVISION SUPPORT)

42. Corps

The actual number and types of engineer units to be employed in a type corps depend upon the mission; the character, disposition, and capabilities of the enemy; terrain, weather, and the availability of engineer troops. The majority of corps engineer troops perform tasks within the corps boundaries to the rear of division areas. Elements and/or one of the combat groups may be utilized to reinforce or support the divisions in the forward areas depending upon the amount of engineer effort required. Corps engineer support in the type field army consists of the following organizations:

a. One engineer brigade headquarters.

b. Three engineer combat group headquarters.

c. Nine engineer combat battalions, army.

d. One maintenance company, direct support.

e. One topographic company, corps.

f. Two float bridge companies.

g. Two panel bridge companies.

h. Two light equipment companies.

i. One dump truck company.

j. Various TOE 5–500 teams as required.

43. Field Army

The actual number and types of units employed in a type field army depend upon the same contingencies as in corps. The majority of the units perform their tasks within the army boundaries to the rear of the corps areas: the combat groups, however, are usually employed in the corps rear area and/or army forward area where they support corps operations. The engineer support in a type field army may consist of—

a. One engineer brigade headquarters.

b. Three engineer combat group headquarters.

c. Nine engineer combat battalions, army.

d. Nine float bridge companies.

e. Six panel bridge companies.

f. Three light equipment companies.

g. Three engineer construction group headquarters.

h. Nine engineer construction battalions.

i. Six construction support companies.

j. Six dump truck companies.

k. One maintenance and supply group.

l. One water supply company.

m. One camouflage battalion.

n. One topographic battalion.

o. One engineer company, REDSTONE, organic to the Artillery Missile Group (Heavy).

p. Various TOE 5–500 teams as required.

Section IV. ENGINEER SUPPORT FOR TYPE COMMUNICATIONS ZONE

44. General

Engineer support requirements in the communications zone cannot be estimated as closely as those for a type field army since topography, climate, configuration, number of troops supported, duration of the campaign, speed of operational development, enemy capabilities, and the logistical mission all dictate and control operations. In a new theater there will be greater initial demand for construction which will diminish as the area is developed. The maintenance load will increase as construction is completed. Paragraphs 45 through 48 describe a representative engineer support in a typical communications zone.

45. Construction

The great volume of engineer construction and rehabilitation work in the communications zone of an active theater of operation demands numerous construction units of varying types. These units are category II and III (table I) and support the combat forces by construction and allied activities in the rearward areas. Coordination and supervision of these units is accomplished by the employment of an engineer command headquarters—brigade or group. The brigade, composed essentially of construction groups—although it may have other types of engineer units—is employed, as required, to command, perform operational planning and supervision, and coordinate the activities of the construction groups when engaged in extensive and complex construction operations. Construction groups provide command, control, staff planning, supervision, and administration of four engineer construction battalions and assigned or attached

construction-support units. They plan for and supervise construction or rehabilitation of roads, railways, buildings, bridges, utilities, installations, airbases, pipeline systems, and major port facilities when augmented by port construction specialists. Typical engineer construction units comprising construction groups are—

a. Construction battalion, having a large amount and variety of construction equipment with which to perform all construction commonly required by both the Army and the Air Force in a theater of operations.

b. Construction support companies which maintain and operate heavy construction equipment in support of the construction battalions and other units.

c. Dump truck companies which maintain, transport, and operate dump trucks in support of construction battalions and other units.

d. Pipeline equipment companies which maintain, transport, and operate petroleum pipeline construction equipment in support of construction units engaged in pipeline and related facilities construction.

e. Port construction companies which operate in conjunction with other engineer units and perform specialized tasks in the construction and rehabilitation of port facilities, inland waterways, POL marine terminals, and facilities pertaining thereto.

f. Teams of the engineer service organization which are attached to engineer construction units.

46. Mapping and Geodesy

The base-type topographic battalion is designed to permit augmentation with military and civilian units and personnel. It will usually have subordinate company-size units assigned to perform each of the following activities: geodetic and topographic surveying; reproduction; and distribution. A TOE 5–500 relief map making team is often attached to the reproduction element for limited production of plastic relief maps.

47. Maintenance and Supply

Maintenance and supply groups in the communications zone differ from those found in a field army, in that units are assigned for depot maintenance, and operation of base depots, as well as field maintenance operations.

48. Utilities and Firefighting Detachments

Utilities detachments are desirable at major headquarters,

hospitals, ports, general depots, staging areas, and recreation areas. Fire fighting detachments are desirable at every city, port, depot, hospital, and large cantonment. Fire fighting platoons and utilities detachments are often detached from the engineer command and placed under the command of nonengineer echelons, such as areas, districts, hospital centers, large ports, and general depots. Composite fire fighting companies made up of TOE 5–500 teams may be furnished in lieu of separate fire fighting platoons.

Section V. ENGINEER SUPPORT OF MISSILE OPERATIONS

49. General

a. Missile operations by the Army are of two types:

(1) That, in support of a field army in which field artillery missile groups—REDSTONE, CORPORAL battalions, HONEST JOHN Rocket battalions, NIKE and HAWK battalions are employed; and

(2) That, in support of Allied forces in localized hostilities, in which three types of United States Army Missile Commands—Heavy (REDSTONE), Medium (CORPORAL), and Air Transportable HONEST JOHN are employed.

b. These tactical units are allocated as required and are capable, due to their organic logistical organization, of rapidly providing missile support to any troubled area of the world.

50. Engineer Support of Missile Operations in Theater of Operations

a. Major engineer effort is required in support of the field artillery mission group, REDSTONE. REDSTONE missile activities require large quantities of liquid oxygen and smaller quantities of dry ice or liquid nitrogen. In addition, high pressure air compressors, special fire fighting apparatus, air conditioners, heaters, and electric generators, including precise power alternators, are required. The engineer company, REDSTONE (TOE 5–214), organic to the REDSTONE missile group, is capable of providing the necessary field maintenance support for the special engineer equipment utilized by the artillery, ordnance, and engineer REDSTONE companies.

b. Engineer support furnished the other members of the missile family—the CORPORAL battalions, HONEST JOHN ROCKET battalions, NIKE and HAWK battalions—is not as specialized as for the REDSTONE group. These missile organizations have a standard variety of engineer equipment, with special

emphasis on high psi air compressors, air conditioners, heaters, and precise power generators. TOE 5–500 field maintenance teams are provided for attachment to missile battalions as required.

51. Engineer Support of U.S. Army Missile Commands

a. U.S. Army Missile Command (Heavy). This command is an artillery unit consisting of ordnance, signal, armored reconnaissance companies, and a REDSTONE field artillery battalion. The engineer support consists of a REDSTONE company, serving in the same capacity as in the field artillery missile group, REDSTONE; and an augmented engineer combat, army.

b. U.S. Army Missile Command (Medium).

(1) *General.* The U.S. Army Missile Command (Medium) contains five missile units and sufficient combat and service-support units to enable it do deliver effective fire support when deployed independently. The command is designed for the support of less developed allied nations having no nuclear capability. Its command and logistic structure allows the necessary flexibility to meet the particular requirements of these anticipated areas of operation. It contains a headquarters and headquarters company; one field artillery group headquarters; four HONEST JOHN battalions; one CORPORAL battalion; one augmented engineer combat battalion, army; one armored infantry battalion; one signal company, one sky cavalry battalion; and one service and support group.

(2) *Engineer support.* The organic engineer support of the medium command is a modified and augmented engineer combat battalion, army, TOE 5–35D. The modification consists of the deletion of one combat company. The augmentation increases the liaison, survey, maintenance, camouflage, and construction capabilities of the battalion. The augmenting elements consist of—

(*a*) *Liaison augmentation.* The is the addition of a missile command section, with one officer and two enlisted men, which is similar to that of the assistant division engineer section in the infantry division engineer battalion, and operates in a like manner.

(*b*) *Survey augmentation.* To increase the topographic support the battalion is augmented by a geodetic detachment consisting of two TOE 5–500 teams, Team IJ and Team IB.

(*c*) *Maintenance augmentation.* An engineer field maintenance detachment, Team EH TOE 5–500, appears on

the augmented TOE of the combat battalion as an augmentation to the battalion; however, it is utilized more effectively if it is attached to the service and support group of the command. It provides engineer field maintenance support for both conventional and special items of engineer equipment to include precise power generators and special electronic devices.

(*d*) *Camouflage augmentation.* One camouflage company is attached to the combat battalion to provide the required increase in camouflage capabilities.

(*e*) *Construction augmentation.* To increase the battalion's earthwork capability, the construction equipment has been augmented.

c. U.S. Army Missile Command (Air Transportable).

(1) This command is the smallest of the three missile commands, and is capable for being transported by air. It consists of a headquarters and headquarters company, one HONEST JOHN battalion, one signal company, one rifle company, an augmented engineer combat company, army, and a service and support company.

(2) The engineer combat company is modified and augmented to provide a survey element and water supply teams.

Section VI. ENGINEER SUPPORT FOR THE AIR FORCE

52. General Requirements

The Corps of Engineers supports the Air Force in two areas—it furnishes mapping and geodetic services, and performs construction required by Air Force operations. Mapping and geodetic services include the provision of ground control, maps, and related data for weapon systems, as required by the unified command for theater Air Force tactical and strategic planning, training, and operations. Air Force construction requirements vary from new construction to rehabilitation to emergency recovery activities. Since all major engineer construction units are capable of performing heavy earthmoving, paving, and theater of operations type general construction, any logical combination of such units may be used to accomplish Air Force requirements.

53. Responsibilities

a. The Department of the Army is responsible for providing the required support for the Air Force, and for organizing and training the units necessary to supply this support.

b. The Department of the Air Force is responsible for providing its current and anticipated construction and mapping and geodetic requirements to the Department of the Army in broad terms which can be translated, by the Army, in terms of types and quantities of army support required.

c. The theater army commander is responsible, within his theater, for providing Air Force construction and mapping and geodetic support. Minor Air Force construction tasks may be assigned to a construction battalion or smaller unit.

54. Types of Support

Construction support can be either in response to specific project requirements, or in response to a stated need for emergency recovery activity, or both. Provisions for the latter is ordinarily planned on a continuing basis. If construction support is required in areas containing no Army component, engineer construction units may be assigned or attached to the commanding headquarters. When assigned or attached, these units remain under the control of the senior engineer unit commander unless otherwise determined by the Army commander releasing them, or by higher army authority. The Army commander releasing the unit for the mission determines whether or not there is a need to augment the unit to insure adequate command and control.

55. New Construction

a. General. Engineer construction support of Air Force operations involves construction of forward cargo fields, forward tactical fields, medium and heavy bomber fields, missile sites, and protective construction.

b. Procedures. The theater Air Force commander advises the theater Army commander of the Air Force requirements for construction of airfields and any other facilities and their general location. To facilitate project planning, the appropriate Air Force commander also provides a general siting plan supported by a development plan which includes any special requirements. He furnishes and defines aircraft characteristics, allowance factors, and formulas; broad design, layout, and construction criteria; and policy guidance in the form of definitive drawings, specifications, regulations, manuals, or any other references applicable to theater of operations construction requirements unique to the Air Force. With the receipt of this information the theater engineer establishes support policy and assigns or allocates design and planning projects to a subordinate command—an engineer brigade or construction group. Normally an engineer construction group re-

connoiters the various proposed sites and makes recommendations to the brigade, or in the absence of a brigade, to the senior army commander, for final site determination. Upon approval of the location the group normally prepares plans and specifications by site adaptation of standard designs. After approval of plans and specifications, determination of construction priorities, and receipt of the construction directives, the group commander directs one or more of his attached construction units to execute the work. The group tests and inspects the construction for compliance with plans, specifications, and sound construction practices.

56. Rehabilitation

a. General. Installation maintenance and repair are the responsibilities of the air installation unit; however, when an existing airfield or other air facility is deteriorated or damaged to a point requiring repair of sufficient scope to constitute a substantial project, it is then rehabilitation and is the responsibility of engineer construction units. The engineer construction battalion is the logical unit to be assigned airfield rehabilitation projects. It is capable of performing rehabilitation in a concentrated area or in numerous dispersed sites.

b. Procedures. Requirements for airbase rehabilitation support in oversea areas are determined by the theater Air Force commander and transmitted to the theater Army commander, where they are processed in the same manner as for new construction.

57. Emergency Recovery

a. General. The local Army commander coordinates with the local Air Force commander for the allocation of available engineer construction resources for emergency recovery activities. Based upon these allocations, an engineer construction unit commander is assigned responsibility for planning, in close coordination with the Air Force installation commander, the support for a designated installation in the event of damage by enemy attack. Immediately following an attack, emergency plans are implemented with repairs limited to emergency restoration of utilities and high priority operational facilities.

b. Procedures. Based upon theater policy the local Army commander assigns emergency recovery support missions to the engineer construction units. The assignment of one engineer unit to provide this support to as many Air Force installations as practical is essential to the maximum utilization of the engineer effort. (The assignment directive should indicate priorities and mutual support arrangements.) The mission of emergency recovery sup-

port does not permit stockpiling of equipment or the placing of personnel on a standby status. Engineer unit commanders plan for employment of mobile and well balanced recovery forces, each capable of rapid assembly and movement to the damaged airfields or other facilities. On arrival at an installation, recovery forces operate under the supervision of their own commander and assist the local commander in the recovery mission as required.

CHAPTER 5

ENGINEER SUPPORT IN OFFENSIVE OPERATIONS

Section I. NORMAL OPERATIONS

58. General

a. In discussing combat engineer activities in an offensive operation a prototype unit, the infantry division engineer battalion is used. The engineer battalions organic to the armored and airborne divisions, and the nondivisional combat units operate in a similar fashion, modified by the nature and activities of the combat forces of which they are a part. Those operations which differ considerably from those of the prototype battalion are discussed separately in the section on special operations in this chapter.

b. An offensive operation has a twofold purpose—to close with and destroy, or capture the enemy, and to seize and control terrain in anticipation of future operations. A divisional offensive operation normally has three main phases—*advance, development,* and *attack.* If the enemy is routed there may be a fourth phase—*pursuit.* This section deals with the engineer missions and employment in these phases.

c. Offensive operations are characterized by swift maneuver, violent assault, and rapid exploitation. Upon seizing the objective, minimum forces consolidate gains while the bulk of the attacking force disperses rapidly. Offensive operations in a nonnuclear conflict differ from those in nuclear war only in regard to the combat power. A principal consideration in nonnuclear warfare is the fact that it can suddenly become nuclear. Hence, regardless of whether or not the situation is nuclear, any concentration of troops and materiel which offers an attractive target is undertaken only as a calculated risk.

59. Engineers in the Advance

a. Covering Forces. A division moving to contact may be preceded by a self-furnished covering force operating directly under divisional control. If the division is operating as part of a larger element, the covering force is frequently furnished and controlled by higher headquarters. Missions assigned to a covering force

are broad in nature and may include developing the enemy situation, attacking to destroy enemy resistance, seizing and holding critical terrain, or containing large enemy units. Engineer support in a covering force should be located well forward and contain engineer reconnaissance teams to aid the movement of armor, artillery, and the essential infantry support. Obstacles which cannot be bypassed are breached or surmounted. The type of obstacles, the time, and equipment available determines the method employed. Breaching usually involves removal or destruction by demolition. Surmounting calls for bridging or ramps. The width and number of passages through an obstacle, be it a complex barrier or a minefield, is determined by the passage preparing capability of the supporting engineer element. The location of the passage(s) is determined by terrain, enemy position, and the extent of the obstacles. Road gaps which cannot be bypassed are hastily repaired or bridged. The engineers are so armed as to resist enemy interference while conducting these tasks. Because of the distance involved in covering force operations, engineer troops are usually attached to the supported force.

b. Advance Guard. Behind the covering force the main force advances. Each column is preceded by its own advance guard which protects from ground observation and surprise from the front, and furnishes the time and space necessary to enable the main body to deploy for combat. Each advance guard column is supported by engineer troops, and reconnaissance elements, the commander of whom functions as the unit engineer of the advance guard commander. During the advance of a battle group either a platoon from the supporting engineer combat company, or the organic engineer platoon, normally forms a part of the advance guard. When these engineers are on foot, they are supported by mounted engineer troops with tools and equipment, following by bounds, or are equipped with standard mechanical clearing equipment compatible with advancement of foot troops. The point engineers normally have mine detectors and probes. They search for and mark or open a lane through an enemy minefield. (The complete clearing is undertaken after the tactical units have moved on and there is no urgency.) Within their capabilities, they remove all obstacles which have been left, or partially breached by the covering force. Removal or breaching of complex obstacles may require additional engineer troops and equipment which are moved forward from the support or reserve. The point engineers maintain contact with the advance guard engineers and relay information concerning the required forward engineer tasks. The remainder of the engineers with the advance guard, with

tools, transportation and equipment, move with the support or reserve, and leave work parties at vital points where the need for engineer assistance exists or is anticipated. These parties rejoin their units on completing their tasks. The advance guard engineers may thus be depleted at the end of the march, and it may be necessary to renew their strength by substituting new units from the engineers with the main body. When the main force is not preceded by a covering force, the advance guard normally is stronger, with a corresponding increase in the strength of the engineer support.

c. Flank and Rear Security Forces. Flank and rear security forces protect the main body from ground observation and surprise attack. These forces must be sufficiently strong to defeat minor resistance or to delay strong enemy attacks on the flanks or rear long enough to permit deployment of the main body. Engineers support the flank and rear security forces by assisting in the blocking of avenues or approach by creating such obstacles as craters, contaminated areas, minefields, demolished bridges, tree blowdown, floods, etc.

d. Main Body. The main body is the bulk of the advancing force's combat power. It is immediately available to attack the main enemy force and seize the objective. The remainder of the supporting engineer troops is so positioned in the advancing columns of the main body to permit maximum flexibility and communication with security elements for employment during the advance when they are needed to reinforce or replace the advance guard engineers or the flank and rear guard engineers.

60. Engineers in the Development and the Attack

In part, the duties of the engineers in the development period and the attack proper resemble those in the advance: assisting the movement of infantry and supporting arms by clearing obstacles, barriers, and fortifications; assisting the troops protecting the flanks by creating obstacles on avenues of approach to the flanks; and performing routine engineer tasks, to include supply of potable water, maintenance of engineer equipment, technical assistance in regard to camouflage and combat deception measures. As the attack develops, however, new demands for engineer support arise. Reconnaissance is required both before and during the attack, especially of the main supply route and other routes of advance, and of enemy obstacles and barriers. Specialized assistance from engineers may be needed to pass, breach, or remove obstacles; assault fortified positions; establish flank protection; or organize captured ground against counter-

attacks. Upon gaining control of an area the creation of rudimentary advance landing strips for the division's light aircraft will be required. (Site selection for these landing facilities is of vital importance to the engineer commander, as he must evaluate each potential site in the light of anticipated engineer effort, materials, and construction-time requirements.) Water supply points must be established over a wide area because of the dispersion of the attacking units. These water points are just as mobile as the unit they are supporting, and when possible are located in the vicinity of the supported unit's class I distribution point. Routes of advance for combat troops and essential supplies are established and maintained.

61. Engineers in the Pursuit

The pursuing force, which is essentially an extension of the attack, is reinforced by engineer, artillery, armor, combat aviation, and sometimes airborne troops. It is characterized by boldness, speed, mobility, fire power, and coordination of the combined arms team. The size of the supporting engineer force depends upon the size of the pursuing force and the anticipated engineer work during the operation. Engineer units and materiel are located well forward in the columns to facilitate rapid stream crossing and removal or breaching of obstacles. Engineer elements of combined arms teams should be afforded the same protection and mobility as the rest of the combat troops, e.g., armored personnel carriers when participating with tanks and infantry mounted in armored personnel carriers. Engineer units are usually attached to the major pursuing force because of the distances involved.

62. Control

a. Disposition. To assist the mobility of the attacking force efficiently and effectively it is essential that the engineers be in close contact with the committed units. Proximity enables them to anticipate the needs of the attacking troops, and to have the maximum engineer support available for meeting those needs promptly. The division engineer recommends the disposition of engineer troops and equipment for all phases of the offensive operation and recommends appropriate changes in disposition as changes are indicated. This disposition is normally made by assigning engineers specific tasks, placing engineer units in support of other elements, and, under certain conditions, such as during a task force type operation, attaching the supporting engineer unit.

b. Liaison. Liaison between supporting and supported units and between adjacent units during the attack assures cooperation

and coordination among all units participating in the operation. It is the responsibility of the supporting unit to establish and maintain liaison with the supported organization. Liaison between adjacent units is established as directed by the senior commander —usually each unit is charged with maintaining liaison with the unit to the right. The assistant division engineers are the chief liaison agents between the engineer battalion and division headquarters and, in the infantry division, with the infantry brigade headquarters. Liaison functions between the supporting engineer company and a battle group are performed by personnel designated by the company commander. The liaison officer, usually the company executive officer, is familiar with the capabilities and operations of both units and keeps himself informed of all plans and operations to give reliable and up-to-date information and advice to both commanders. If a further breakdown of engineer elements is necessary, liaison is established with their supported organizations.

63. Assistance to Division Engineers

When the divisional engineer battalion is unable to perform all the engineer tasks required in an offensive operation, the division commander, upon recommendation from the division engineer, requests and usually receives assistance from corps or army. At the beginning of the attack a corps engineer combat group may assume some of the division engineer battalion's responsibilities in the division rear area, progressively extending its boundary forward to relieve the divisional battalion. An engineer combat battalion from a corps engineer combat group may be attached to an infantry division for a river crossing operation, returning to the control of its parent unit at the conclusion of the operation. In a major attack the corps engineer combat group may designate one or more of its combat battalions as direct support battalions, operating with the division and often in the same areas as elements of the divisional battalion. Such units remain under group control. Except for special operations it is normally desirable for corps engineer units, under parent unit control, to support the division on an area-assigned basis. Boundaries between the divisional and corps engineer units are established informally to denote the forward working limit of the supporting engineer unit. Such working limits eliminate unnecessary concentration of nondivisional troops in forward areas. Specific missions forward of a work limit, such as bridge or road construction and maintenance, are made on a task assignment basis. The size of the engineer elements attached or supporting is governed by the anticipated strength necessary to reduce ob-

stacles and to support the advance of the assaulting forces. When necessary nondivisional engineers may be further attached to battle groups. Regardless of the seniority of supporting engineer unit commanders, the commander of the divisional engineer battalion remains the division engineer and directs the engineer work in the division area through liaison with the supporting units or through recommendations to the division commander.

64. Economy of Engineer Effort

There are seldom enough engineer troops available to accomplish all the pioneer work necessary to assist the advance of the infantry and supporting arms. To insure that the maximum engineer effort is available for significant tasks which require engineer skills and equipment, troops of combat arms and services participate as required in such pioneer tasks as—

a. Expedients for stream crossing.

b. Control of fires in forested or built-up areas.

c. Preparation of protective obstacles.

d. Minefield laying and breaching.

e. Expedient road and culvert repair.

f. Execution of camouflage projects.

65. Reconnaissance

a. The collection of engineer information is a mandatory requirement on all engineer elements in an offensive operation. It is as continuous and detailed as conditions permit, and is performed prior to the advance, during the advance, and during the attack proper. Initially, reconnaissance teams from battalion headquarters provide the division engineer with early and reliable information of the area over which the division will advance, with particular emphasis on the condition of the proposed routes of advance, alternate routes, enemy obstacles, local resources, possible water supply points, and favorable terrain conditions. This on-the-ground reconnaissance is supplemented by information gained from air reconnaissance, maps, photographs, and other collection agencies. The combined information aids the division engineer in estimating the required engineer materials; preparing plans and work estimates; and developing in cooperation with other agencies, traffic circulation plans.

b. Engineer reconnaissance continues during the advance. Engineer reconnaissance elements from the supporting units accompany the advance guard of the leading battle groups to provide the main body with advance notice of engineer requirements at

the front. All engineer troops with the advance columns collect and *report* pertinent engineer information.

c. During the attack the reconnaissance teams from engineer battalion headquarters continue their general reconnaissance, closely following the forward engineer companies. They pay special attention to the routes of advance. When necessary, personal reconnaissance is made by the commander. Engineer companies attached to, or in support of, battle groups make continuous reconnaissance of routes of advance, particularly the main supply route, obstacles, mines, potential water supply points, and sources of engineer materials in their assigned areas. Special reconnaissance missions are assigned by the battalion S2. On the basis of this reconnaissance information, engineer operational plans are made and means are provided to assist in maintaining the momentum of the attack.

66. Supply

a. At least one engineer supply point is operated for a division and is normally adequate. In a rapid advance, however, if the division is operating on a wide front, or if the road net is poor, secondary supply points with limited stocks may be in order, and may be established anywhere in the division area. Camouflage material supply points and lumber distributing points may be established. Water points are established, their location determined by the tactical situation. The division engineer is responsible for map supply in accordance with the map supply policies established by the division G2.

b. The main supply point should be beyond the range of enemy medium artillery and easily accessible from the main supply route. When the division is in bivouac the main supply point is usually located near the headquarters and service company, taking advantage of any natural concealment afforded by the terrain and supplemented by artificial camouflage if necessary to protect it from both aerial and ground observation. When the division resumes the advance the supply point should move in two echelons to permit the opening of a new location before closing the old. If it is necessary to advance in one echelon, the vehicles carrying the supplies then become the supply point.

c. The division engineer is responsible for the engineer supply for the entire division, and has command responsibility for the supply of the engineer battalion. He establishes and operates the engineer divisional supply installations, delegating details to the S4 of the battalion. Requisitions for engineer supplies are submitted by the requesting unit to the proper supply points or

depots. (Field army headquarters normally determines which supply point or depot will supply which unit with what items.)

d. The principal items of engineer supply in an offensive operation are the materials necessary for the repair and maintenance of the routes of communications. Crushed rock is needed in large quantities, and if possible, is procured locally. Road timber is concentrated in dumps, and bridge timbers and steel I-beams are placed near bridges for the anticipated repair and reinforcement. As the attack progresses, the dumps are advanced and local resources, i.e., rock quarries and standing timber, are utilized. As the division advances, the army engineer, operating through the army maintenance and supply group, assumes the operations of the dumps as the division engineer relinquishes them. The army engineer aids the supply operations of corps and division engineers by advancing materials to forward dumps and operating them with army engineer personnel.

67. Intelligence, Mapping, and Geodetic Support

Intelligence, mapping, geodetic, and related data are particularly essential during an offensive operation, and result in an acceleration of associated intelligence and topographic activities. Often the advance will be into relatively unfamiliar territory, necessitating rapid up-dating of existing maps, utilization of captured enemy maps; substitution of up-to-date aerial photomaps until topographic maps are available; rapid distribution of maps; and rapid establishment or reestablishment of survey ground control.

68. Camouflage

The basic principles of camouflage are followed in an offensive operation as well as in a static or defensive situation (FM 5–20). The responsibility for camouflage rests on the commander. However, all troops must be aware of the principles and construction techniques of camouflage. Technical advice and assistance is the responsibility of the engineers. The division engineer, under the general staff supervision of the division G2, is normally responsible for camouflage planning, in coordination with the operations and supply sections. In a fast moving offensive situation it is doubtful if time will allow extensive artificial camouflage measures, however, engineers advise and assist other troops in the utilization of natural terrain features which will aid in camouflage and concealment.

69. Security

a. General. Security encompasses all the measures, active and

passive, taken by a command to protect itself from surprise attack, observation, and harassment by the enemy. All engineer commanders are responsible for the security of their own commands; the degree depending upon the enemy situation, the terrain, position of friendly troops, mission of the command, and most important, the security measures taken by a higher command. It is impractical for a unit to provide absolute security for itself. This would require all members actively engaging in a security mission, resulting in a deterioration of the command and making it impossible for the unit to accomplish any other mission. Rather, the engineer commander adopts sound and reasonable measures for security and determines the size of the security detachment accordingly.

b. Security During Movement. The engineer commander of a unit on the move has various methods of providing the necessary perimeter security, the choice dictated by the situation. There is usually a frontal security force, the advance guard, and security forces to the rear and on the flank. Aircraft plays an important role in the security of a large engineer unit in movement, i.e., a battalion, by checking far removed advance and flank areas, can warn of enemy activities and possible ambush. Communications are vital and organic communications equipment is used to control the movement as much as the tactical situation will permit.

c. Security in a Stationary Position. An engineer unit in a stationary position, such as a temporary halt during a march, in bivouac, or employed at a worksite, must also have perimeter protection. This protection can be had by using its own troops or by arranging for the provision of security forces from another combat unit. A frequently employed form of security is the outpost system, composed of sentinels, outguards, and visiting patrols, with its strength, location, and composition depending again upon the enemy situation and local conditions.

d. Protective Action. While the outpost system provides warning, it cannot be expected to repel a serious enemy attack. As soon as it is apparent that some action must be taken to repel the enemy, the engineer unit commander takes positive aggressive action, following the principles outlined in the basic infantry battle drill outlined in FM 7–10. When the enemy has been repulsed or destroyed the engineer unit returns to its original and primary mission, and the outpost system continues to be maintained.

Section II. SPECIAL OPERATIONS

70. River-Crossing Operations

a. Support. The engineer element of both the infantry and airborne divisions have limited river-crossing capabilities. Without additional support from corps or army they are restricted to spanning short gaps. After the initial assault wave divisional engineers are normally engaged in aggressive support missions, well forward, on the far shore. The armored division engineer battalion, with its organic three sets of M4T6 bridging (each set provides two heavy rafts or approximately 141 feet of float bridge) is capable of supporting a limited hasty crossing of the armored division. In a deliberate crossing the bulk of the engineer support for all divisions comes from the corps engineer combat groups. In a corps crossing, if one division makes the initial assault there is normally one engineer combat group in support, in addition to the organic engineers. (If more than one division is involved in the initial assault, an engineer combat group is needed in support of each.) The float bridge companies provide the boats, bridges, and rafts, and the engineer combat battalions of the group provide the personnel possessing the specialized techniques and knowledge of "task organization," such as rear-area fabrication, serial transport of rafts and bridge sections, and quick loading and unloading procedures which insures rapid construction. Heavy float bridging is ready for use as the attack reaches the river line. This decreases the loss in attack momentum and obviates the necessity for separating light and heavy combat equipment. Mobile floating assault ferries and bridges provide the heavy combat equipment a mobility comparable to that of the amphibious personnel carriers. Other units from the group which may be used in a deliberate river crossing are the light equipment companies which provide erection aids, and the dump truck companies which provide additional transportation. In addition to the support from corps, attachment of engineer troops from army may be required because of special conditions or unique characteristics of the water barrier. In such instances, the additional troops are attached to the corps engineer groups and employed as needed. In a deliberate river crossing, with corps and army providing additional supporting engineer personnel and equipment, the divisional engineers should be employed where they can be released to accompany their division and provide close forward support. In a deliberate river crossing the armored division engineer battalion, along with its organic bridging, is normally held out to provide engineer support on the far shore since it is better suited for breaking out of a bridgehead than for

forcing a crossing. Some elements, however, may be used to operate assault boats during the assault phase, or to perform preliminary work on bridge approaches or access roads before the assault. The engineer amphibious support command may also be used to support combat units in large-scale river-crossing operations by supplementing the corps engineer river-crossing capabilities. It is held at army level for employment as required in any or all phases of either a hasty or deliberate crossing.

b. Employment. The preservation of the integrity of the engineer units, and normal unit association are particularly desirable for river-crossing operations. There may not be enough divisional engineers, however, for these direct support tasks, and assistance from the corps engineer unit will be required. In theory, the divisional engineer units support and aid their normally supported battle groups in both the crossing and the assault on the far shore, and the nondivisional engineers are allocated such tasks as the installation or erection of fixed and floating bridges, road work, and the relief of the divisional engineers of rear area tasks, initially on the near bank and progressively on the far bank as the attack advances. In a small-scale operation, if the situation requires the use of assault boats and footbridges, the division engineers might be given the attendant duties, in addition to their forward support tasks. As in all complex operations, the engineer capability is severely taxed during a river crossing operation. Therefore, specially trained teams of other arms and services may have to undertake the breaching of minor obstacles, particularly those encountered unexpectedly on the far bank.

c. Control. The division engineer is the responsible engineer in a division river crossing operation as in any special operation where additional engineer support is required. His knowledge of the procedure and the capabilities of the divisional units and the division's method of operation places him in the position of being the engineer who can best recommend the location, employment and strength of the engineer support. He is responsible for the technical plans for crossing the division. He determines the engineer assistance required and works closely with supporting engineer unit commanders in the coordination of the engineer support for the crossing. Engineer commanders responsible for specific tasks control their necessary engineers. Divisional engineer troops accompanying the assaulting force may be in direct support, or under certain conditions, attached—the attachment ending as soon as possible. Corps engineer troops, aiding in the crossing of the assaulting forces are normally in direct support and remain under the command of the engineer group commander.

Corps engineer troops on rear area tasks, bridge construction and repair, etc., normally are in general support remaining under group command.

d. Duties and Responsibilities. The general mission of the engineers in a river-crossing operation is to furnish engineer support to the assaulting troops before, during, and immediately after the crossing. This may include—

(1) Construction, maintenance, and repair of road nets and routes of communication.
(2) Removal of mines and other obstacles.
(3) Construction of near-bank ferry and bridge approaches.
(4) Operation of assault boats.
(5) Construction of footbridges.
(6) Construction and operation of ferries.
(7) Installation of vehicular bridges, floating and fixed.
(8) Construction of far-bank exits.
(9) Construction of bridge protective devices.
(10) Construction of dummy bridges for deception purposes.
(11) General engineer work, including water and map supply, miscellaneous engineer supply, camouflage supervision, and demolitions.

e. Special Considerations.

(1) *Supply.* A reserve of engineer equipment is necessary to insure that the river-crossing means are kept in operation. Although engineer combat groups supporting the divisions must have more organic bridging material than is required for the construction of the planned bridges, adequate material should be placed near the bridge sites to maintain the bridges after they have been built, and to replace damaged or destroyed material. This prevents the organic equipment of the engineer groups from being dissipated in maintenance operations. Corps G4, after conferring with the corps engineer, arranges with army G4 for the establishment of such engineer bridge dumps.

(2) *Traffic control.* Traffic regulation involves planning, routing, scheduling, and directing the use of routes by surface vehicles, personnel, and equipment during all phases of the crossing. This planning is a staff responsibility of G4 and is closely coordinated with G3, the provost marshal and the division engineer. A responsible engineer headquarters exerts technical control at an

engineer regulating point to insure proper use of the river-crossing means, to include—

(*a*) Examination of vehicles to detect improper loading with respect to technique, weight, or dimensions.

(*b*) Recommendation for rerouting or halting of certain traffic when technical difficulties make one or more of the crossing means inoperable, or curtail its carrying capacity.

(*c*) Assistance to the traffic control headquarters in maintaining maximum traffic density.

(*d*) Provision of the correct classification of each crossing means to the traffic control headquarters.

71. Assault of Fortified Positions

a. General. Permanent fortifications constitute one of the most formidable obstacles that an advancing army may encounter. Their passage usually imposes a delay upon the advance, and their reduction, which is necessary to prevent enemy troops from infiltrating and reoccupying them, is a lengthy and laborious undertaking. For these reasons, an effort is normally made to bypass fortified positions, and reduce them later by attack from the rear. If this course is impossible, or not feasible, they are reduced by frontal attack.

b. Reconnaissance. Before the attack begins an engineer study of terrain, bridges, routes of communications, artificial obstacles, etc., is made. The proper technique and the necessary personnel and supplies for the attack, as well as the subsequent reconstruction plans, are all dependent upon this study. The most profitable source for this information is ground reconnaissance. For areas beyond the reach of ground reconnaissance, reliance is on air photographs and other sources.

c. Engineer Support. The engineer support in an assault of a fortified position is fundamentally an application of the same techniques used for breaching any obstacle of magnitude. In this instance, however, it is in conjunction with a combined arms team, and under heavy fire. During the attack the principal mission of the engineers is the breaching of the outer and larger obstacles which protect the main fortified position. Specially organized and equipped infantry squads are charged with the reduction of weapons emplacements, bunkers, and pillboxes, and the clearing of close-in and minor obstacles. Close coordination is essential between those engineers breaching the line of obstacles and those infantry squads reducing the fortifications. After

the fortified line has been breached, the primary engineer task is then the creation and maintenance of routes to and through the gaps, with a secondary mission of destroying, by demolition, the captured forts or pillboxes. As the assaulting troops break through or envelop the enemy position, engineers overcome the remaining enemy rear area obstacles.

d. Methods. When reducing field fortifications by the use of explosives, the techniques employed are essentially the same as those employed in the reduction of concrete walls. ADM may be used to reduce a fortification, if its extent warrants it. The resulting contamination, however, must be eliminated, or materially reduced, if friendly forces are to occupy or pass through the area. The best types of artillery fire against permanent concrete fortifications are the high velocity armor piercing projectiles and high explosive projectiles with special concrete piercing nose fuzes, fired at short range by direct laying weapons. Long range indirect fire is ineffective against pillboxes. High explosive projectiles with standard fuzes are not effective against concrete pillboxes unless they enter an aperture, although they may be used with armor piercing rounds to clear away weakened and shattered concrete. Mechanical means are usually not effective for large scale reduction of permanent fortifications. Engineer vehicles, however, because of their armor protection, mobility under fire, and special accessories, are used to great advantage in the destruction and removal of obstacles—bulldozers are effective in surmounting or bridging of obstacles, and the rapid construction and maintenance of routes into and through the gaps. The engineer combat vehicle is particularly designed for use against fortified positions. Other engineer equipment is used to clear rubble and debris resulting from the explosive demolition of permanent fortifications. If all captured fortifications must be made unusable, bulldozers can bulldoze earth into the entrances of the captured fortifications as a substitute for demolishing them.

e. Organization for Work. Engineer clearing parties may be organized into task groups to accomplish the supporting mission of the engineers in an assault of a fortified position. These groups might be used for the following specific tasks:

(1) Preceding the breaching personnel to clear antipersonnel mines.
(2) Breaching or neutralizing a particular obstacle.
(3) Marking the boundaries after the breakthrough.
(4) Providing local security.

(5) Standing by as a contingent to replace or reinforce, as the casualties are normally heavy in such operations.

72. Airborne Operations

a. General. The construction, maintenance, and/or rehabilitation of airstrips and landing facilities are the primary concerns of the supporting engineer elements in an airborne operation. The airborne division engineer battalion has the capability of providing air-landing facilities suitable for assault aircraft. In addition, it provides necessary engineer support to the committed combat groups. The degree of capability dictates the number of air-landing facilities that can be developed and this degree is dependent upon the utilization of existing roads, the type of soil, existence of cleared areas, available construction material, weather conditions, and other factors affecting construction effort. If appropriate to the airhead development plan, nondivisional engineer troops from corps or army may be given responsibility for continued development or expansion of air-landing facilities. In the event nondivisional airborne engineer troops are made available for initial development of air-landing facilities, the organic engineering battalion would be free to perform combat engineering tasks in an assault role in support of its division. The engineer construction support required depends upon whether or not there are existing airfields or air-landing facilities, the schedule of operations, and the air-landing facilities construction criteria. If adequate sites are not available, the demand on the engineer capabilities is extremely heavy, and the construction and development problems are manifold. These problems can be alleviated somewhat by intelligent and careful site selection; establishment of minimum construction standards; and the selective use of the specially tailored, equipped, and trained airborne engineer units. Unnecessarily high air-landing facilities standards and unrealistic time schedules require an early air movement of large tonnages of engineer equipment which could conflict, at a critical time, with the vital movement of the tactical units.

b. Employment. One or more engineer platoons are normally attached to each battle group for the airborne assault, reverting to battalion control as early as possible after the assault. The remaining platoons are kept under battalion control. Construction and river-crossing equipment, organic to headquarters and headquarters company is furnished to the engineer companies as required.

c. Organization for the Assault. The engineer battalion is normally organized into three echelons:

(1) The assault echelon includes the bulk of the engineer battalion and contains the personnel, equipment, and material from the headquarters and headquarters company, and the two airborne engineer lettered companies required to support the initial assault. This echelon enters the objective area by parachute or air landing, or a combination of both.

(2) The following echelon includes personnel and equipment (less the rear echelon) not initially brought into the objective area. The followup echelon normally joins the assault echelon as soon as practicable by air or surface means, or by a combination of these methods.

(3) The rear echelon consists of the administrative personnel who are normally incorporated into a divisional pool and left in the departure area. In an operation of long duration the rear echelon may be brought into the airhead to support subsequent operations.

d. Operations.

(1) Airborne operations involve the assault from the air and require a high order of audacity, timing, and contact. The combat forces normally enter combat by a combination of parachute assault and air landing. The mission and plan for tactical operations of the airborne force, terrain, weather, and the enemy situation and capabilities must be considered in assigning engineer troops supporting missions. The engineers may have to meet concurrent and pressing demands for engineer work of both an offensive and defensive character, often interrupted by the need to fight to defend themselves and their worksites.

(2) The initial tasks of those elements of the engineer battalion in the assault echelon may include: removing obstacles from or improving existing airfields or air landing facilities; initiating construction of air landing facilities on predesignated landing zones; executing limited demolitions and hasty obstacle construction; and on a limited scale, neutralizing minefields and enemy prepared demolitions, and conducting river crossings, expedient bridge construction, and minor bridge repair.

(3) No two situations will be the same. The battalion commander must prepare his unit to meet any possible emergency and his plans must be flexible. A typical sequence of engineer activities after the assault echelon

lands in the objective area would be: assembly of personnel and equipment into predetermined work parties; followed by immediate execution of preplanned tasks. Water points should be established and initial routes of communication should be opened as soon as practicable. Necessary adjustments to initial plans must be made as the situation develops.

(4) As the situation stabilizes, the duties of the airborne engineer battalion become similar to the duties of the infantry engineer battalion in its support of normal ground operations. After the airhead has been firmly established, airborne units are either relieved to permit preparation for subsequent airborne assault or continue further ground operations.

73. Amphibious Operations

a. General. The Engineer Amphibious Support Command (EASC) is designed to support one reinforced army corps in major amphibious operations. Its principal role in this support is to provide the nucleus about which the corps shore party can be organized for carrying out a particular operation. This nucleus is intended to provide the corps only with the basic capability that will enable the combat units to effect an assault landing. In order to carry out its assigned mission fully, the corps shore party command must further be augmented with combat and/or construction engineer units to perform the numerous engineer tasks and other attached units which furnish the supporting services such as supply, maintenance, signal, medical, and a type transportation unit. The engineer role, therefore, is one of combat support, with the followup service-support functions left to the Army logistic service branches. In essence, the EASC is an organization of skilled combat specialists trained to perform their tasks under conditions peculiar to amphibious operations and capable of operating with equal effectiveness under either nuclear or conventional combat conditions.

b. Mission. The EASC's mission is to carry out combat and combat-support functions in offensive and defensive action in the beach or shore area and along the waterbound flank, including the support of additional landings in effecting the expansion of the objective area, or in coastal redeployment of combat forces, by—

(1) Providing, as the basic nucleus for a corps shore party, the command and control elements for all shore party units, and the minimum equipment necessary to carry out the primary mission.

(2) Providing, with organic and attached units, assistance to combat units in the passage of water. These operations will include—

(*a*) Landing on a hostile shore.

(*b*) Crossing major rivers or water barriers.

c. General Organization and Employment. The EASC consists of approximately 3,000 officers and enlisted men. To carry out its mission successfully, this large command must organize and marshal its resources and facilities for employment on a basis of complete flexibility. This fact of utter flexibility is the uniquely identifying charactertistic of the command, elements of which must be prepared to support, as required, either an entire corps, one or more of its divisions, or one or more of a division's battle groups.

(1) The EASC is composed of a headquarters and headquarters company and four different type battalions; Engineer Amphibious Battalion, Engineer Amphibian Equipment Battalion, Amphibious Signal Battalion, and a Service Support Battalion. Command is vested in an engineer officer, who is also designated as corps shore party commander upon activation of such a unit. Similarly, each subordinate shore party commander is an engineer officer, fully responsible for all shore party activities within his beach support area.

(2) To provide an adequate shore party nucleus, the EASC has built-in organizational and functional flexibility which enables it to support a single battle group, a division, or any combination of these up to and including a corps. Within the headquarters and headquarters company this flexibility is provided for through three support group commands. If required, a fourth support group command may be formed from the staff of the engineer amphibious battalion. These group commands function as a command and control element for a division shore party; for controlling more than one division shore party in the event that the EASC is employed to support less than a corps but more than a division; or as an alternate headquarters for the command. A division shore party will then consist of a support group command, an engineer amphibious company, an engineer combat battalion (army) and other attachments. Similarily, shore control sections are provided from within the engineer amphibious battalion to furnish command and control elements for battle group shore parties within the divi-

sions. To provide the command with an amphibious movement capability, there is an engineer amphibian equipment battalion equipped with landing vehicles tracked (LVT's). Also contained in the EASC is a service support battalion and an amphibious signal battalion to perform supply and maintenance functions, together with furnishing additional medical and signal facilities.

(3) The EASC shore party nucleus is a tailored organization formed for the support of the assault forces. Because an amphibious assault starts with "zero" strength on the beach, initial engineer support must be directed solely to building and employing its EASC support task group in such a manner as to provide immediate support of assault requirements. Usually, the nature of the attack is such that fully organized TOE support units cannot be put ashore intact at the beginning. The shore party plugs the gap until such units can be landed and become fully operational. Thus, the need for a shore party exists only during the assault phase. But long before the shore party, with the EASC, is fully phased out of beach operations, logistical service units have begun phasing ashore and usually form part of the shore party. Many of the units landing to furnish followup support are from the Logistic command. These units provide, among other facilities, boats for lighterage once the amphibian ships and their organic craft leave the objective area. Amphibians are designed mainly for assault purposes, although they can be used for resupply purposes. Boats, however, are the answer to the required movement of large quantities of waterborne supplies. After the shore party is phased out and a logistical command takes over responsibility for the beach support area, the EASC is released for other assignments.

(4) Employment of the EASC is not limited to joint assault landing; the resources and facilities of the command are also employed in waterborne movements by army units alone. Examples of such operations without naval support are crossings of inland water, coastal bays or estuaries, and major inland river crossings (par. 60). In such cases, the EASC has the command and control nucleus and the amphibian transportation means to control, lift, and move assault units.

CHAPTER 6
ENGINEERS IN DEFENSIVE OPERATIONS

74. General

a. The infantry division engineer battalion is again the prototype units in this discussion of combat engineer activities in a defensive operation. A defensive operation is employed to deny a vital area to the enemy, to protect a flank, to contain an enemy force, to gain time, to economize on forces, or to effect the maximum destruction and disorganization of the enemy. There are two types of defensive operation—*area* and *mobile*—the primary differences being the manner in which the forces are disposed and the size and intended use of the reserve or striking force.

(1) The area defense is a relatively compact defense in which the battle area is organized into a series of mutually supporting defensive areas. Forward portions of the battle area are strongly held. Terrain may be controlled temporarily with nuclear fires and units may be in dispersed assembly areas adjacent to critical terrain, prepared to occupy it, or call for nuclear fires on it, if its seizure is threatened. The depth of the defense is relatively shallow and is organized with the aim of stopping the enemy forward of the battle area. If the enemy penetrates the area he is destroyed or ejected.

(2) The mobile defense is a fluid defense. Forward areas are lightly held by forces which block, impede, and canalize the enemy. The bulk of the forces is in reserve and used as a striking force. In a mobile defense it is anticipated that the decisive combat will occur within, or forward of, the battle area, and principal reliance is placed on bold and vigorous aggressive action to destroy the enemy. Frontages and depths are usually greater than those for the area defense.

b. The division commander specifies the type of defensive position to be used and the priorities of construction. The division engineer advises the commander on such matters as mine

laying, camouflage measures, supply of class IV camouflage and fortification materials, employment of ADM weapons, and the employment of the engineer troops. The division engineer assists in the formulation of the overall barrier plan and its implementation.

75. Disposition of Engineer Support

Defense, regardless of type, consists of three echelons—the security force, forward or fixing force, and the reserve or striking force.

a. The security force provides early warning of the advance of the enemy, delays and disorganizes his advance, and deceives him as to the true location of the battle area. It normally consists of a covering force, usually with engineer support. Since all elements of the covering force are under a single command, the engineers supporting this portion of the security echelon are attached. Behind the covering force is the general outpost line (GOPL) (equivalent to the reconnaissance and security force (R and S) employed in a mobile defense), organized forward of the forward edge of the battle area. There is no prescribed organization for the GOPL, or the R and S, though it is normally a balanced combined arms force, having an engineer company attached. The engineer company commander advises the GOPL commander, or the R and S commander, on engineer work and assigns missions and areas of responsibilities to his platoons. Each platoon with an area assignment is responsible for keeping open the main withdrawal route within its area, and prepares the obstacles along that route. Each platoon leader is also responsible for preparation and execution of obstacles on the lateral roads within his respective area. If two engineer companies should be attached to the general outpost, the battalion executive or other designated officer would be sent forward as the unit engineer to coordinate the engineer effort of the two companies.

b. The forward or fixing forces on the forward edge of the battle area, (FEBA), which is the main area of resistance, normally have one engineer company in direct support of each committed battle group. Engineer platoons organic to the battle groups, manning the forward edge of battle area, will normally accomplish engineering tasks in support of the combat outpost line. The remaining engineer companies are in general support of the division, having a second mission of supporting, on order, the battle groups with which they are normally associated.

c. The engineer support for the reserve or striking force is usually provided by engineer units placed in direct support

prior to or upon commitment of the reserve or striking force. In the mobile defense, the striking force must be given priority of engineer support because of the mission of the unit.

76. Control of Engineer Effort

Engineer elements may be attached to the battle groups or may be retained under the control of the battalion commander, and give direct support to the battle groups. The criteria for attachment or support are the tactical situation and the ability of the parent organization to effectively control and direct the action of the subordinate elements. The discussion of control of engineer units in the offensive (par. 62) applies to defensive operations as well.

77. Assistance to Division Engineers

When a division organizes its own defensive position the engineer battalion will require and normally receive assistance from corps. The corps engineer combat group may assume certain road work and the supply of water in the rear areas; emergency installation of standard equipment bridges to replace damaged or destroyed bridges in the division area; earthmoving operations; specialized camouflage tasks; and the preparation of obstacles and positions for the rear flanks or blocking positions. Also technical specialists not available to the division engineer may be provided by higher engineer commands. If a need is anticipated, and the situation permits, a defensive position may be completed by corps or army before the arrival of the occupying troops, in which instance civilian labor is often used to the maximum.

78. Reconnaissance

As in the offense, engineer reconnaissance in the defense is continuous and detailed and is initiated immediately upon the decision to occupy a position. Great emphasis is placed on the preparation of terrain studies; routes of communication for counter attack forces; obstacles and demolition sites; and natural cover. In an area defense the engineer battalion reconnaissance teams search the area in detail and report all items of engineer interest which become the basis for barrier and obstacle plans; routes of supply, evacuation and withdrawal; and denial operations plans. In a mobile defense, engineer reconnaissance is carried out in conjunction with the attack plans under the directions of the unit engineer with or without personnel from the battalion reconnaissance section. Often a divisional defensive position is familiar and information on the area is in corps or army. The division

engineer is responsible for the collection and utilization of this available intelligence.

79. Supply

a. The division engineer is responsible for supplying camouflage and field fortification materials to all divisional and attached units. In a defensive operation the amount of materials required may be so great that transportation must be furnished by division or from supporting transportation units.

b. For hasty positions, distribution points or stock piles for materials are located rearward. Distributing points may be located on the flanks or in the defensive areas behind the battle area. Infantry units carry their own entrenching equipment sets and are supplemented by hand tools carried by engineers. Heavy engineer equipment is used when necessary and practical.

c. Deliberate defensive positions demand that the supply of materials be planned and regulated by the division engineer in coordination with G3 and G4. Special tools and heavy equipment, in addition to that equipment organic to the engineer battalion, is obtained from corps and army engineer units or from class IV depots. Materials are brought up by the using unit or by supporting truck units routing them through a distribution point which serves as a dispatching station. To insure economical use and distribution of materials, a simple system of property accounting is advisable.

80. Barriers and Obstacles

a. Barrier and obstacle planning is developed concurrently with other plans, and can be planned and executed by all echelons of commands. Extensive strategic or major tactical barrier systems, however, are directed by corps, or higher. G3 has general staff responsibility for the tactical employment of barriers and obstacles, but the staff engineer has the special staff responsibility for their planning. The staff engineer prepares terrain and barrier studies for G2, and advises G3 as to means and extent of augmenting natural obstacles. He plans and supervises the technical aspects of barrier employment and aids G3 by preparing the barrier annex to the operation plan or order, under the direction of G3. Division barrier and obstacle planning is usually supplemented by detailed planning of tactical obstacles at the battle group or combat command levels.

b. The construction of obstacles for close defense is the responsibility of the unit commander involved, and may be in-

tegrated with a barrier plan of division or higher echelon. Normally each tactical unit is responsible for the construction of the obstacles of that part of a barrier system which lie within its area. Engineers furnish assistance in the form of effort, advice, and technical supervision. They have the responsibility for the siting and construction of obstacles when—special skills and equipment are required; flanks and rear are exposed; the command as a whole will benefit from the effort; the obstacles must be prepared before the position occupying troops arrive; or when the construction lies beyond the responsibility of a particular subordinate unit.

c. In the area defense, obstacles are used extensively. Time permitting, the natural defensive charactertistics of the terrain are improved and augmented by artificial obstacles until a barrier zone has resulted which the enemy cannot penetrate without a costly loss. In a mobile defense, obstacles and barriers are employed to delay or canalize the enemy. They must be carefully coordinated, however, because of the necessity for freedom of movement of the maneuvering forces in a counterattack. Gaps and lanes must be available for friendly tanks and armored infantry to move forward or backward or to adjacent areas for battle positions. In a static situation extensive use is made of mines, and fabricated and excavated obstacles. When time and resources are limited, obstacle and barrier planning must reflect this limitation. Atomic demolition munitions are one solution because of their capability for producing rapidly obstacles of magnitude, such as, craters, tree blowdown, landslides, flooding, and contamination. When available, mechanical mine planters and earth digging devices reduce the labor and time requirement. Mines are used as an obstacle, or as a supporting obstacle in a system. The integration of chemical mines in the system produces contamination which makes breaching operations more difficult and time consuming. Extensive use of mines, however, does pose a logistical burden and should be limited to relatively static or economy-of-force defensive situations required by concurrent offensive operations.

81. Field Fortifications

a. The defense is built around a series of organized and occupied tactical positions which are selected for their natural defensive strength, their contribution to the mission, and the degree of observation they will afford. These natural positions are strengthened by field fortifications, always considering the fire plan and the scheme of maneuver. Well planned and constructed

fortifications should provide the desired degree of protection, and also bring the enemy under a maximum volume of effective fire as early as possible. Plans normally consider construction by phases, meaning that the protective construction proceeds from the minimum to the ultimate.

b. The siting and construction of field fortifications for the protection of troops is the responsibility of the individual unit commander involved. The staff engineer assists by preparing plans and orders and conducting technical inspections. Engineer responsibilities are primarily technical. The supervisory engineer personnel, however, are familiar with the tactical considerations affecting the organization of the ground which allows them to give valuable technical assistance and advice. The staff engineer is responsible for the production of terrain intelligence studies from which the fortifications are planned and developed. The engineer's primary responsibilities in the construction of field fortifications are to—

(1) Supply field fortification materials and hand tools.
(2) Furnish technical advice and assistance.
(3) Accomplish large-scale excavation and backfilling.
(4) Increase the effectiveness of extensive emplacements through the creation of protective obstacles.

82. Camouflage

Refer to paragraph 68.

83. Security

a. The security measures taken in a defensive operation are essentially the application of the basic principles of maintaining security under any condition (par. 69). There may be times, however, in a desperate defensive situation when engineer units will be given an infantry type combat mission to aid or supplement the major combat force. When this happens the engineer units must be prepared to deploy with a minimum of delay. The major force commander is responsible for the decision to commit engineer units for sustained ground combat, which he does only after serious consideration of the following:

(1) *The situation.* Will the enemy force be able to seriously affect the command if the engineer unit is not committed?
(2) *Loss of engineer support.* Can the command afford the temporary loss of engineer support?
(3) *The strength of the engineer unit.* Is it large enough to be effectively employed?

(4) *Weapons support.* Can adequate weapons support be provided to make the unit effective?

(5) *Support after commitment.* What fire and logistical support will the engineer unit need from supporting units in carrying out the mission?

b. Commitment of an engineer unit to an infantry type combat role is not instantaneous—it requires time for the unit to prepare for such a mission; items of equipment must be moved to relative safety; personnel needed for essential noncombat activities must be removed; and support for the committed unit must be established.

c. It is not possible to have one definite infantry type combat plan for all engineer units, therefore each unit has its own plan, incorporated into SOP, reflecting the unit's individual characteristics. Having the plan alone is not adequate, however; to guarantee the plan's success the unit must be highly trained to insure a smoothly functioning unit when the plan is implemented.

CHAPTER 7
ENGINEERS IN RETROGRADE MOVEMENTS

84. General

A retrograde movement is any movement to the rear, or away from the enemy. It can be a withdrawal from action; a delaying action; or a retirement. Such movement is undertaken to disengage from combat; to avoid combat under unfavorable circumstances; to draw the enemy into an unfavorable position for him; to gain time; or to permit use of the force at another location. Regardless of the reason for such a movement, it is primarily a defensive action which involves rearward movement, a "stalling" for time, and a sacrifice of terrain.

85. Disposition of Engineer Support

It is normally necessary to echelon the withdrawing units, leaving a security or covering force to protect the withdrawing elements of the main force, by stopping, restricting, or diverting the enemy advance. This permits the main force to disengage, assemble, and move to the rear. In a divisional retrograde movement the typical disposition of the engineer support consists of an engineer company supporting the security or covering force, an engineer company in support of each major element of the withdrawing force, and the remainder of the engineer battalion in general support of the division. The exact composition and disposition of the supporting engineer elements depend upon the enemy situation, the terrain, the composition of the withdrawing forces, and the tactical situation.

86. Reconnaissance

Engineer reconnaissance in a retrograde movement emphasizes the collection of advance information on roads, bridges, terrain, installations, and natural resources in the territory through which the move will occur. Normally this territory is familiar, having been in friendly hands, and detailed reconnaissance reports are obtainable through engineer channels.

87. Routes of Withdrawal

A division in a retrograde movement normally moves over the

roads which have been used to supply the division or to serve the corps and army troops behind and are in relatively good condition. If the enemy has effective airpower, however, he will seek, during the retrograde operation, to destroy bridges and to block roads by attacking and wrecking motorized columns. Engineers with the advance guards are responsible for the repair of such damage and to prevent serious delays.

88. Security and Delaying Operations

Security and delaying operations in a retrograde movement do not differ from those in a defensive operation. The support provided by the engineers includes the use of demolitions, minefields, other obstacles, denial operations, employment of ADM, and assistance to other units in the organization of the ground and flank security. Particular emphasis is placed on the preparation of demolitions to be executed by the rear guards, or last elements, of the security or covering force; the hasty installation of obstacles to cover temporary positions occupied by elements of the covering force such as light banks of wire and abatis; or the emplacing of antipersonnel, antitank, and delayed action mines and boobytraps.

89. Denial Operations

A denial operation is any action taken to deny the enemy the use of material objects, facilities, and geographical areas. A theater or theater army denial policy is normally the basis for detailed denial planning in the combat zone. It is a command responsibility, with authority usually delegated to subordinate commanders to effect denials as a normal activity within their areas, subject to the limitations and directives published by higher headquarters. The general and special staff responsibilities are the same for denial operations plans as for barrier plans. Denial operations involve the removal, damaging, or destruction of objects, or the denial of ground through the use of mines, flooding, chemical agents, or demolitions. In a retrograde movement the division commander, acting under orders and policies of higher authority is responsible for preparing and executing a plan for denial operations in his area. In the division, denial operations are normally incorporated in the barrier plan. The divisional engineer battalion is exceptionally well suited and equipped to supervise and execute such denials. All troops, however, participate in certain aspects of a denial operation, including the destruction of organic equipment and supplies, procedures for which normally being a part of their unit's SOP.

90. Supply

In a retrograde operation the division is usually moving toward its base of supplies. Engineer items needed particularly during the movements are those required for the temporary repair of the routes of withdrawal and for the temporary defensive positions. Issue is largely from vehicles. A supply problem which exists in this situation is likely to be one of excess stocks of supply. Forward movement of supplies stops once the decision to withdraw has been made and existing stocks are used. Those remaining are evacuated, or, if that is not possible, destroyed. The division engineer requests a decision to destroy if he anticipates a necessity, however, the final authority rests with the division commander. If at the end of a retrograde movement, it is planned to occupy and organize a defensive position, the supply aspects of the operation become those associated with a defensive operation. Usually such a planned position may be developed by corps or army engineers.

CHAPTER 8

ENGINEER OPERATIONS UNDER SPECIAL ENVIRONMENTAL CONDITIONS

91. General

Abnormal environmental conditions can change or even eliminate some aspects of engineer operations. Although engineer units are equipped with materials designed for use within a wide range of environmental conditions, in environmental extremes specialized equipment, techniques, and procedures are sometimes necessary. When the organic equipment is inadequate, inoperable, or of insufficient quantity, the unit equipment may be augmented by conventional equipment, modified by specialized material, or both. Engineer commanders and staff sections of all echelons study all environmental factors, real or anticipated, to determine how troops should be trained and equipped.

92. Desert Operations

a. General. Deserts are arid regions characterized by an almost total lack of rainfall, extensive treeless expanses, and extreme daily temperature ranges. The terrain consists of large level expanses of sand, boulder strewn areas, mountains, dunes, deeply eroded valleys, rock and shale, and salt marshes. A few limestone areas are found with natural caves and crevices which afford defensive protective positions requiring little construction effort. Formidable natural barriers are often present in the form of rock escarpments. All military operations in desert areas are influenced by lack of water, a dearth of well-defined roads, and the absence of natural cover and concealment. For additional information on desert regions, see FM 30–10.

b. Engineer Operational Consideration.

(1) Water supply is the most important single mission of the engineers supporting a desert operation. The discovery of sources requires continuous and intensive reconnaissance. Oases occur in the desert but they are ordinarily separated by great distances. In some areas water may be had from deep wells or by digging into the beds of dry watercourses. Provision should be made

for storage of water at water points and wells. With special apparatus for distillation, the water from salt or alkaline ponds and marshes may be made potable. Because troops are widely dispersed in desert operations and water points are few, transportation of water over long distances becomes necessary. Sometimes pipelines are laid, however, in fast moving situations the hauling of water is the most practical method. This requires that the engineers be supplied with additional tank trucks and trailers.

(2) In bivouacs within the range of enemy artillery, trucks are dug in up to the hoods and tanks up to the top of the tracks to reduce the height of their silhouettes and provide protection from the artillery fire. Bulldozers are useful in aiding other troops dig in their vehicles.

(3) Roads and bridges call for no special techniques in desert operations. Drainage is not a major consideration. Though it is desirable to stabilize the sands, the necessary dust palliatives and soil stabilization materials, such as water and oil, are too scarce to warrant any major consideration of such work.

(4) Engineer supplies are normally meager in desert operations because large concentration of supplies in advance depots are too vulnerable to air attack. Local resources are limited to sand, gravel, and rock.

(5) In some desert areas, special maintenance problems include excessive wear of parts due to sand and dust in the air, and of tires and tracks due to sand abrasion. Shop operations are difficult due to heat and blowing sand.

(6) Mines are easily placed and blowing sand effectively conceals evidence of their emplacement but may adversely effect their proper functioning. Small minefields are of little use since they, like other obstacles, are easily bypassed. Extensive minefields, however, are used to canalize enemy movements into areas where other obstacles may then prove effective.

(7) Lack of natural concealment places special emphasis on camouflage measures. Pattern painting, or any other method of covering all reflective surfaces is necessary. Large camouflage installations defeat their own purpose, but deceptive measures, such as dummy installations, assume increased importance. Strict control of vehicle tracks is necessary to avoid disclosing positions.

(8) In retrograde movements the destruction of water sources and stocks of fuel and water is vital. Wells and pipelines are destroyed, stocks of water released, and sources which cannot be destroyed are contaminated. The extent of destruction, as in all denial action, is governed by the directives of higher authority which consider plans for the possible future use of the area.

(9) A desert area normally has little, or no, existing ground control and special consideration must be given to the required survey support for artillery, missile, and other using units.

93. Extreme Cold

a. General. Special and critical problems arise when operating under conditions of extreme cold, heavy snow, and ice, which exist in northern latitudes and in certain regions of the temperate zone in winter and in Alaska and other Arctic and subarctic regions. In these regions temperature as low as —40° F. are common and they may go as low as —60° F. The amount of snowfall varies greatly depending upon the ocean currents and moisture content of the air. Heavy snow and extreme dry cold normally are not found in the same region. Snowfalls several feet in depth are often accompanied by high winds, creating deep drifts. For additional information see FM 30–10.

b. Engineer Operational Considerations.

(1) Many engineering operations are affected by the existence of permafrost. Permafrost is frozen ground, varying in thickness from a few inches to a hundred feet or more. As long as it remains frozen it makes a good foundation, but when thawed, it loses its bearing capacity.

(2) In Arctic and subarctic areas there are many marshy areas with a resilient carpeted surface of bog moss and sedges, which are termed *muskeg*. They have a high moisture content and very low bearing power. The insulation qualities of the surface material may hinder freezing during winter.

(3) Loose snow 1 to 2 feet in depth is generally impassable for wheeled vehicles but with tire chains they can travel very well over packed snow. When prolonged cold can be anticipated, snow roads will suffice. They can be constructed usually with no difficulty, by packing the snow with tracked vehicles. If they are subject to slight surface thawing and the surface turns to ice they

must be well sanded or have set-in-wood cleats. Roads over snow clear areas are slow and difficult to construct. If the site is subject to an appreciable amount of thawing special attention must be given to drainage.

(4) Bridges are subject to foundation difficulties, if they are to remain in use during the warmer seasons. Sills and cribs must be set and piles driven into ground not subject to freezing and thawing. Bridges over streams of any size should be designed to resist extreme flows and heavy ice movement.

(5) Special procedures are required for water supply. Water is found under the ice in any deep pond, lake or stream, but pumps, filtering apparatus, and stored water must be heated. Troops draw water more frequently but in lesser quantities because of the difficulty of keeping it. Often in forward areas the only source of water will be melted ice or snow. The supply will ordinarily not be plentiful because of the scarcity of fuel with which to melt snow due to transportation difficulties. When water can only be obtained from ice and snow it is the responsibility of each unit to supply its own water.

(6) The supply of engineer materials is made more difficult by transportation difficulties. Local resources of sand and gravel are difficult to locate under snow and ice and to excavate when frozen. They must be thawed before use. In permanently cold regions, standing timber is rare or nonexistent.

(7) Proper maintenance of vehicles and power equipment in very low temperature is difficult. Maintenance work in the open at a temperature of —25° F. is extremely difficult and heated shelters must be provided.

(8) In areas of heavy snow and ice geodetic control is sparse or nonexistent. Additional topographic troops are normally required to supply survey data for weapon systems.

94. Mountains

a. General. Military operations in mountainous terrain involve relatively small forces with independent missions, as the difficulty of movement makes close mutual support impossible. Infantry and supporting groups are specially trained and usually only light artillery and light vehicles are employed. The problems falling to the engineers are greatly multiplied and, for this reason, the proportion of engineers to the size of the force is greater than in other operations. Large quantities of heavy

equipment cannot ordinarily be employed, consequently there is greater emphasis on work with hand tools and light powered equipment. Mountain operations generally center about the lines of communications through the mountains. Most mountain operations are directed toward opening, securing, or denying the use of passes and other key points on the lines of communications.

b. Engineer Operational Considerations.

(1) Construction of new roads in mountains is an engineering task of major proportions because of the amount of rock excavation required. Ordinarily road work will be limited initially to the maintenance and repair of existing roads and trails with plans for their subsequent progressive improvement. Routes should avoid the bottoms of gorges, which are subject to torrents and usually filled with boulders. Ridges are avoided since they allow traffic to be silhouetted against the skyline. Side-hill cuts are the rule and follow the contour to avoid excessive fills or bridging. Special attention must be given to drainage on the uphill side. Culverts must be of ample capacity to take the high flows during spring thaws.

(2) Bridging operations in mountainous terrain normally is limited to the spanning of short gaps using prefabricated materials. Suspension bridges may be employed for longer spans. Cableways and tramways are frequently used to move light loads and personnel over gorges and up and down steep slopes.

(3) Organization of the ground presents special problems since excavation will usually be in rock. To some extent this excavation may be reduced by the use of cobbles and boulders for parapets and breastworks, but they are not effective against artillery fire. Protective works may be made of logs if standing timber is available.

(4) Obstacles are particularly effective in mountainous terrain, since it is very difficult to bypass them. Properly placed and covered by fire they can often make the approaches to a position or to other commanding ground almost impassable.

95. Jungles

a. General. Jungles impose certain special problems by virtue of their heat, heavy rainfall, and dense growth. Jungles are sparsely inhabited and good roads and other necessities of civi-

lization are rare or nonexistent. Movement of troops and supplies through jungle growth is most difficult and visibility is limited to a few feet.

b. Engineer Operational Considerations.

(1) The construction and maintenance of roads is of the greatest concern to engineers in jungle warfare. Generally every road to be used by our troops must be newly built. Ground water is frequently found within a few inches of the surface requiring special attention to subgrade drainage. Time is often saved if the site is thoroughly drained before attempting to work the road with heavy equipment. Frequently the soil is composed of decayed vegetation which must be removed and replaced with some suitable material, such as the coral found on the coasts of many tropical islands of the Pacific.

(2) Bridge design should consider the intense rainfall and flooding combined with steep gradients of streams. For small bridges it may sometimes be advisable to allow for normal flow only, and to be prepared to replace the bridges promptly.

(3) Native timber varies from very soft and pulpy to extremely hard wood. The former quickly deteriorates, while the hardest woods are almost impossible to work. In training for jungle operations, personnel should study engineer intelligence reports to be able to identify useful timber. As a general rule the softest woods have a bulbous shape just above the ground line. The coconut palm grows in tropical and semitropical areas near salt water throughout the world. It is readily accessible and of convenient shape, but like other palms is soft and deteriorates rapidly. Often there is more suitable timber in the area that should be used when the structure is to last more than 3 months.

(4) Water supply is rarely a serious problem. In many areas a water source may be created at will by merely excavating a pit below the ground water table. Where the topsoil is underlined with coral, potable water is often found on the coast as close as 50 feet to the shoreline. Personnel coming in contact with raw water must be given special protection because of the danger of contracting certain serious diseases caused by waterborne organisms peculiar to the tropics.

(5) Shelters are very quickly and easily constructed by native methods with local materials. They consist of a light frame with a thatch roof and half walls of woven palm leaves.

(6) Certain problems of maintenance are accentuated by the effects of high temperatures and humidity. Bright metal surfaces must be continually protected by grease or paint. Rubber and plastic parts, particularly those in ignition systems, will require replacement more frequently. Leather and fabrics are subject to mold, forming overnight, and must be kept clean and treated with preservatives. Engineer equipment is frequently employed in beach areas and exposed to immersion in salt water or to salt water spray. Under such conditions it should be thoroughly washed with fresh water as often as possible.

(7) Jungle areas are usually lacking in suitable geodetic control. Topographic troops are normally required to provide this control for weapons systems.

96. Urban Areas

a. General. Urban areas are marked by closely grouped buildings, consisting of houses, industrial plants, and commercial structures. There is normally a dense network of transportation facilities present also.

b. Engineer Operational Considerations.

(1) All vehicular movement is canalized by streets and alleys. Buildings become part of the defensive systems, as they offer cover and concealment for troops and weapons.

(2) Because of the very nature of urban areas extensive damage and destruction and troop casualties are caused by the secondary effects of an enemy attack, i.e., flying debris, falling walls, and conflagrations.

(3) In urban areas the engineers are particularly concerned with the rehabilitation of important and sometimes vital utilities and facilities.

(4) Obstacle removal is exceptionally difficult in urban areas. Great quantities of debris and electrical lines block the streets. Demolitions facilitate its removal by breaking up and dislodging the tangled mess, but heavy duty, fast moving, mechanical earthmoving equipment is needed to accomplish the actual clearing.

(5) The firefighting responsibility of the engineers assumes great importance in urban areas because of the increased danger of conflagration due to the broken gas mains and downed electrical equipment.

(6) Urban areas require large scale topographic maps (usually 1:12,500), known as military city maps, which are used by engineers as well as by other arms and services. Military city maps are essential for Civil Affairs administration.

97. Forested Areas

a. General. Forests are considered a special environmental condition only when considered in light of nuclear warfare. A tree blowdown from a nuclear detonation is a formidable obstacle and can cause heavy casualties to troops. If the blowdown traps units in fire susceptible forests, their immediate extrication is paramount.

b. Engineer Operational Considerations.

(1) Heavy earthmoving equipment is required to create a passage through a tree blowdown area.

(2) As an obstacle, tree blowdown can be used effectively in both offensive and defensive operations.

(3) Depending upon the tree species, tree condition, moisture content, and general forest condition, thermal radiation induced fires may ensue.

CHAPTER 9
ENGINEER INTELLIGENCE MAPPING AND GEODETIC ACTIVITIES

Section I. ENGINEER INTELLIGENCE

98. Introduction

a. Engineer intelligence, including maps, ground control, and related materials is required in all theater echelons for tactical, technical, and strategic purposes and when properly exploited as engineer tools may allow a numerically inferior force to achieve relative superiority.

b. The Corps of Engineers is charged by regulation with producing all intelligence maps, geodesy and related materials needed to carry out its own mission, plus the needs of the U. S. Armed Forces, particularly the Army. Production is normally accomplished by engineer personnel.

c. Engineer intelligence in the broadest meaning includes area or geographical intelligence, and technical intelligence as covered in FM 5–30; Military Mapping and Surveying (Topographic and Geodetic Service) as covered in TM 5–231, and AR 117–5.

d. The nature and amount of specialized information needed by the Corps of Engineers in the conduct of engineer operations in a theater of operations is comprehensive. This information becomes engineer intelligence after it has been evaluated (to determine the pertinence, the reliability of the source and agency through which it was derived, and its accuracy) and interpreted (to determine its significance).

e. Special emphasis in the engineer intelligence effort is directed toward nuclear warfare and the effects of CBR agents. Engineers are vitally interested in the destructive effects of nuclear weapons on the natural terrain, aboveground and underground structures and installations, equipment, stored supplies, and personnel; and in the influence of terrain and weather on these effects. Chemical, biological, and radiological contamination of terrain, structures, installations, supplies, and equipment will have a serious effect on engineer operations. Of particular interest is the ability of hasty or deliberate protective structures to withstand a nuclear

explosion and to protect personnel from chemical, biological, and radiological contamination; and the engineer role in recovery from the effects of a nuclear explosion. Engineer intelligence reports on such items as soils, atmospheric conditions, and the various manmade features should always give consideration to the nuclear and CBR aspects of the subject under consideration.

f. Engineer intelligence, an organic part of Army intelligence, both strategic and combat, is of interest to other arms, services, and agencies. In the same way other agencies intelligence activities may be of interest to the Corps of Engineers. Full use should be made of both command and technical channels, to obtain information possessed by other headquarters, whether superior, subordinate, or laterally situated in the chain of command.

99. Responsibilities

The intelligence officer is the commander's principal staff assistant for intelligence activities. In a large command, the intelligence officer is the G2 (Director of Security in logistical commands). The engineer element of the staff at theater, theater army, field army, and corps has the intelligence element divided into separate elements for the mapping and the intelligence functions, which work closely with the command intelligence officer. At battalion, group, and brigade level the intelligence officer (S2) performs both intelligence and mapping functions. The responsibility for the collection of information falls on every member of the military. The ability to recognize, collect, and transmit information while performing routine assignments is the mark of well trained engineer personnel. For a complete and detailed discussion of engineer intelligence responsibilities in both the zone of interior and a theater of operations see FM 5–30.

100. Engineer Intelligence Elements

Engineer intelligence detachments are under the operational control of the engineer of the command. The operational control of these detachments is not further delegated to other engineer organizations within the command. The detachments should normally be located with the engineer's staff at the command headquarters and, if possible, near the G2's staff (or tactical operations center). These detachments should not be assigned or attached to an echelon lower than corps headquarters to afford maximum flexibility of their capabilities.

101. Types of Engineer Intelligence

a. Terrain Intelligence. Terrain intelligence is the product of the collection, interpretation, and evaluation of information con-

cerning natural and manmade terrain features, weather, and climate of a particular area or region, to include determination of the influence of these factors on military operations. This information is usually presented in the form of a terrain intelligence study, which is prepared by the engineer as required by the commander. In general, the presentation of a specific terrain intelligence study requires an interpretation and evaluation of several, or all of the following subjects:

(1) Geology, soils, surface configuration and shape, vegetation, ground condition, hydrology, water supply, hydrography, and weather conditions.

(2) Routes of communication including roads, railroads, inland waterways, ports and beaches, and airfields.

(3) Urban areas, hydraulic structures, excavations, electric power, pipelines, defenses, and other works of man.

(4) Cross-country movement, suitability for airfield, highway and underground construction, airborne operations data, effects of special weapons, and response of terrain and works of man.

b. Engineer Technical Intelligence. Engineer technical intelligence pertains to the design, operation, nomenclature, physical characteristics, performance, operational capabilities, and limitations of foreign material and facilities, used by or for the support of military forces. It may also include the manufacture, storage, distribution, installation, and maintenance of such material. Also included are operations, organizations, capabilities and personalities of foreign civilian and military engineering activities. Engineer technical intelligence is necessary for the prompt development of countermeasures, prompt exploitation of new ideas derived from foreign sources, accurate deductions as to the enemy's military capabilities, and the effective use of captured engineer material.

102. Collection

a. Direction of the Collection Effort. Direction of the collection effort of engineer information at any level of command is a responsibility of the engineer of the command subject to the commander's policies. This direction consists of—the determination of the commander's essential elements of information (EEI), a preparation of a collection plan, the issuance of orders and requests for information to the agencies concerned, and, finally, the continuing check on those agencies.

b. Sources. In general terms, engineer information in a theater of operations is obtained in three ways: by reconnaissance agen-

cies; by the study of documents, including the interpretation of photographs; and by the interrogation of individuals. Specifically, the sources are—

(1) Ground reconnaissance.
(2) Aerial reconnaissance.
(3) Maps (see pars. 105–108 for details).
(4) Captured enemy documents.
(5) Aerial and ground photographs.
(6) Other documents, including texts, periodicals, and technical papers.
(7) Captured enemy materiel.
(8) Captured enemy installations.
(9) Prisoners of war.
(10) Local civilians.
(11) Refugees.

c. Collection Agencies.

(1) In addition to the engineer intelligence teams and topographic units, certain engineer units such as the Engineer Combat Battalion, Army and the Engineer Combat Group have limited intelligence capabilities. For details of the intelligence activities of the forenamed and other engineer TOE units see the FM 5-series manuals dealing with those units.

(2) Troops, other than engineer troops, especially divisional combat troops, have access to a great deal of engineer information.

(3) The G2, in addition to coordinating the production of intelligence within the command, has intelligence specialists who are capable of exploiting particular sources of information. Of interest to the engineers are interrogators of prisoners of war sections, interpreter/translator sections, photointerpreter sections, document sections, order of battle sections, and field operations intelligence units.

d. Reporting. An agency which has been directed to obtain engineer information makes its report according to SOP or as otherwise directed. The originating officer, if he is not himself a processing agent, transmits it to the appropriate intelligence officer for processing. This procedure would not be followed in combat, or any fast-moving situation, if the information must be acted on at the level received, or at a higher command level, before there is time for formal processing. Due to the diversity

in the nature of engineer information and the use to be made of it, no single form can cover all situations. See FM 5–36 for typical reconnaissance reports.

103. Processing and Evaluating Information

a. Recording is the initial step in the processing of information. If the information comes directly to an engineer command or agency or the intelligence section of the staff engineer's office. Records are kept as follows:

(1) The engineer intelligence journal is the primary permanent record of the operations of the engineer intelligence section.

(2) The engineer intelligence worksheet is an aid in orderly collection and processing of information.

(3) The engineer intelligence situation map provides a graphic picture of the situation, supplements the worksheets, and serves as a base for the preparation of overlays.

(4) Separate files for originals and copies of documents entered in the journal, photograph negatives, and friendly or enemy minefields are maintained.

(5) The intelligence section of the staff engineer keeps up to date information on the location, type, and importance of existing and potential targets of interest to engineer agencies.

b. Evaluation is a vital step in the production of intelligence calling for close examination of the information to determine its reliability of source, accuracy, and pertinence (FM 30–5).

c. Interpretation is the final step in the conversion of information to intelligence and involves judgment. In the light of previously processed intelligence, the enemy situation, and the friendly situation, determination is made as to what interpretation should be given to the new item of information.

104. Dissemination of Engineer Intelligence

Engineer intelligence is transmitted from the agency which processed it to the users. The latter includes other intelligence agencies which may further process it for the use of their own commands. The object of dissemination is to insure the timely receipt by all interested agencies of all the available facts about the enemy and the situation which are pertinent to their needs, and to insure that the factual information and the general intelligence picture at any given time are similar or consistent at all echelons.

Section II. MAPPING AND GEODETIC ACTIVITIES

105. Responsibilities

a. The Assistant Chief of Staff for Intelligence, Department of the Army, is responsible for the planning, programming, direction, and coordination of all mapping activities of the Department of the Army. He is assisted by an advisory body, the Army Mapping Committee.

b. The Chief of Engineers, under the supervision of the Assistant Chief of Staff for Intelligence, Department of the Army, is responsible for the execution of the Department of the Army mapping program, including the acquisition and publication of all geodetic control data. The Army Map Service (AMS), under the direction of the Chief of Engineers, carries out the mapping mission.

c. In a theater of operations, the theater commander is responsible for the accomplishment of the mapping mission, as directed by higher authority, and for the development of a coordinated theater program which meets theater requirements. The theater program will be coordinated with the Chief of Engineers to insure the maximum conformance with and support of the Department of Defense world mapping requirements and priorities as prepared by the Assistant Chief of Staff for Intelligence. Logistical support of mapping operations responsibilities are considerable and are prescribed in AR 117–5.

d. The theater army engineer is responsible to the theater army commander for the coordination of all topographic mapping including that of the Air Force and the Navy, and he exercises centralized technical supervision of all Army topographic units within the theater.

e. The field army engineer, operating in accordance with the policies of army G2, supervises and coordinates all matters pertaining to the preparation, revision, reproduction, and distribution of military maps and map substitutes. He publishes and disseminates ground control data and supplies special survey support to artillery, and to other units as required.

f. The corps engineer supervises the activities of all topographic units assigned to corps, to insure that their operations conform to the mapping policies of the corps commander. He is particularly concerned with map distribution within the corps area.

g. The functions, responsibilities, outline procedures, and instructions for the production, storage, distribution, and procure-

ment of military maps, geodesy, and related materials required by the Department of Defense for planning, training, and operations are of concern to engineers at all echelons. Basic principles for directing and coordinating the production, supply, and distribution of military maps, geodetic data, and related materials are covered in TM 5–231. The mission, capabilities, organizational structure and responsibilities and control of engineer topographic units are treated in FM 5–188. General planning data for staff officers of all echelons and basic data on responsibilities for mapping, types of maps, factors for estimation of various logistical problems in connection with map reproduction, determination of supply and distribution requirements are contained in FM 101–10. Detailed procedures, specifications, and technical information are contained in other Department of the Army manuals.

106. Topographic Units and Their Employment

a. General.

(1) Topographic units—

(*a*) Provide direct mapping support to the appropriate commands to which they are assigned.

(*b*) Furnish ground control for artillery and missile fire.

(*c*) Perform evaluation of aerial photography.

(*d*) Assist, when feasible, in the accomplishment of the the Department of the Army mapping program in coordination with the Chief of Engineers.

(2) The normal assignment of a topographic unit is to TALOG, field army, or corps. As the mapping situation changes, a unit may be shifted from its normal assignment to answer particular mapping requirements, but must usually be augmented. The topographic company, corps, for example, is neither organized nor equipped to perform extensive original map compilations and can therefore be employed in such a capacity only if augmented.

(3) The engineer topographic support available for a typical theater of operations is normally adequate and able to supply the theater with its topographic needs. Small TOE 5–500 topographic units with highly qualified technical personnel and equipment of platoon or team size are provided for special purpose mission and/or augmentation of regular units. Additional capabilities to accomplish a peacetime mapping program may also be obtained from allied government agencies as the result of cooperative mapping agreements.

(4) Topographic units are not used to supplement field printing plants in the production of posters, programs, administrative publications, and other nonmapping projects which would interfere with the mapping mission of the command.

b. Base Topographic Battalion. The base topographic battalion has an elaborate and flexible organization reflecting its varied missions. It is composed of a headquarters and headquarters company; and four companies, each specializing in one of the four basic topographic activities—base survey company, base reproduction company, base photomapping company, and a base map depot company. The photomapping and reproduction elements require semipermanent or permanent facilities in a location undisturbed by airfield, railroad, streetcars, demolition, and like disturbances and supported by reliable utilities. TOE 5–500 teams are attached for special situations to the battalion or its components to increase their capabilities. It operates throughout the communications zone (one to the communications zone of each theater of operations) and is under the direction of the theater engineer. The TALOG engineer is responsible for the administrative and logistical support and tactical security of the battalion. The battalion provides basic materials, such as trigonometric tables and map reproducibles, to the field army and corps topographic units. It procures, compiles, reproduces, and distributes military maps which, when combined with the efforts of all other topographic units, meet the requirements of a theater of operations. It conducts surveys of an accuracy suitable for ground control and assists the theater army G2 and the theater army engineer in the preparation of terrain intelligence reports.

c. Topographic Battalion, Army. The engineer topographic battalion, Army, operates within the field army area, on a basis of one per field army, and consists of a headquarters and service company, one map reproduction and distribution company, and one photomapping company. The battalion commander coordinates the planning and execution of mapping activities with the army engineer and his staff. The battalion provides maps and engineer survey information as required for a field army; reproduces new and existing maps and other intelligence materials; stores and distributes maps and similar materials; performs topographic surveys and provides survey information required by a field army; and when directed, prepares engineer intelligence reports. The base topographic battalion supports the army topographic battalion by supplying basic materials, such as trigonometric tables and map reproducibles, and by carrying horizontal and vertical

survey control forward. In turn, the army battalion supports the corps topographic company by furnishing basic mapping material and extending survey control forward for pickup by the corps companies. When not employed on its normal function of producing maps for use by army, the battalion assists the base topographic battalion in the execution of the theater mapping program.

d. Topographic Company, Corps. Each corps is supported by one engineer topographic company which is designed and organized for the purpose of compiling, revising, reproducing, and distributing maps, and for extending and establishing ground control in support of corps operations. Map compilation is limited to provisional maps. The company commander advises the corps engineer and his staff on all matters pertaining to maps and charts and assists the corps engineer in determining the mapping needs of corps units. He also coordinates with the corps artillery officer the requirements of the artillery in connection with fire control. The company is most effective when it operates close to corps headquarters. When not employed on its primary function of producing maps for use by the corps, the company assists base and army topographic units in the prosecution of the theater mapping program.

107. Mapping Operations

a. Planning. The planning of a military mapping program is the staff responsibility of the G2 of any command, with the senior engineer of the command, under staff supervision of the G2, charged with the production, reproduction, and distribution of maps. The engineer and his staff, in coordination with G2, evaluate the map requirements of the command and establish a program within known engineer capabilities. The theater mapping program will be coordinated with the Chief of Engineers to insure maximum conformance with and support of the Department of Defense world mapping requirements and priorities as prepared by the Department of the Army Assistant Chief of Staff for Intelligence. In developing a mapping program consideration is given to—

(1) Existing map coverage.
(2) Maps and mapping support available from the zone of interior.
(3) Aerial photography and ground control required.
(4) Local mapping agencies and reproduction facilities.
(5) Number, type, and phasing of topographic units.
(6) Special and auxiliary equipment required.

(7) Map supply and distribution plan.
(8) Requirements and phasing of topographic supplies.
(9) Support of allied governments.
(10) Available zone of the interior (AMS) support.

b. Mapping Sources.

(1) *Aerial photography.* The key to adequate mapping is aerial photography. Five hours of good photographic flying above 25,000 feet, with proper equipment, provides source material for more than 200,000 manhours of mapping work for a base topographic battalion. Aerial photography however, must conform to strict standards, for every relatively slight reduction in the quality of the photography may reduce not only the production capacity but also the degree of accuracy, possibly jeopardizing the success of the tactical operation. General procedures and instructions for procurement of aerial mapping are contained in AR 117–5. The production of aerial photography is a responsibility of the theater air commander. Air Force reconnaissance units are trained and equipped to procure and evaluate photographs, to process film, and to supply negatives and a limited number of prints, photomaps, and related data to air, ground, and naval forces. In the early phases mapping photography is a function of the strategic air command, USAF, but as the theater develops, additional photography is undertaken by reconnaissance units assigned to the theater. Naval aviation performs certain collateral photographic missions primarily for naval purposes, which can be of great value to the engineer as additional source material. Requests for aerial photography are made through command channels and are accompanied by a list of minimum standards (see TM's 5–231 and 5–240). The establishment and enforcement of these standards are engineer responsibilities and consists principally of indoctrinating the photographic units, furnishing them with adequate technical assistance, and evaluating the photographs to determine their suitability as mapping sources. In emergencies, practically any photograph can be utilized to some extent by modern photogrammetric methods and equipment. In addition, the field army does have an aerial photography capability in the division and in the army air reconnaissance support company, but due to the type aircraft and camera limitation the resulting photographs have limited mapping application.

(2) *Ground survey and control.* Ground survey is second in importance only to aerial photography as a requirement for new mapping. The extent of additional ground control required varies from little or none in such thoroughly surveyed areas as Western Europe, to the establishment of complete control nets in areas never previously surveyed. Besides the ground survey requirements for interrelating the several national control nets, for support of the artillery, and for radar sitings, there are additional requirements for the support of guided missile operations. The engineer is responsible for assembling and maintaining complete files of ground control data and for disseminating this data in usable form to engineer topographic units, artillery, and other interested units. Principal sources of data are Army Map Service, captured materials, friendly or allied agencies, and field work by engineer units. The extension of ground control is frequently prevented by natural or tactical obstacles or by lack of sufficient time. Sometimes existing control may be supplemented by short-range electronic navigation system (SHORAN) and/or photogrammetric triangulation. To the extent feasible, common survey control should be established and made available to all field army activities requiring accurate position locations. Survey projects must be planned and executed in an expeditious manner commensurate with the most modern techniques and equipment in existence and available. Procedures and specifications for procurement of geodetic control for maps, artillery, and missile units are prescribed in AR 117–5.

(3) *Other sources.* All available material pertinent to the production of maps within the theater can be obtained by the theater army engineer from the Army Map Service. Indexes of all active map series for which reproduction material and map stocks are available are included in the general map catalog of AMS. The Army Map Service library indexes indicate both inactive series and series of which library copies are available. Similar indexes can be obtained from allied and friendly sources. The engineer must establish a map library to which is added all new material from maps compiled from other sources. Copies of such additional material and new map sheets compiled therefrom are forwarded to AMS. Procurement of current and reliable source materials such as bilingual

geographic names and boundry information, becomes a major problem of inaccessible areas and the proper resolution of discrepancies requires well experienced technicians.

c. Map Compilation. The principle agency for the compilation of new maps is the Army Map Service supplemented from within the theater of operations by the base topographic battalion, allied mapping agencies, and local contractors. Map revision, limited compilation, preparation of photomaps and mosaics, and special site studies may be performed by field topographic units. All mapping agencies are integrated with the theater mapping program to the maximum possible extent.

d. Map Reproduction. The essential problem in map reproduction from the engineer's view is the provision of sufficient press capability to meet estimated requirements. The map reproduction capability of the zone of interior must be augmented in the theater by the base topographic battalion, by exploitation of local facilities, and by utilization of mobile reproduction facilities and field topographic units. Map reproduction is an extremely intricate and technical process involving delicate equipment and highly specialized personnel. Assistance of qualified AMS personnel should be sought in planning the theater map reproduction establishment. A reserve production capability should be maintained in the theater to provide immediate support to emergency operations whenever such support is not forthcoming nor desirable from the continental U.S. mapping agencies.

e. Terrain Models. AMS is the principal agency capable of producing terrain models of adequate quality and quantity, although engineering relief-making teams with limited production capacity can be made available for theater use. Terrain models are in great demand for many phases of operational and technical planning, but the production of terrain models is necessarily a time consuming process involving skilled hand labor. For most tactical purposes, embossed plastic maps prove an economical substitute.

f. Distribution.

(1) The basic concept of logistics applies to the supply of maps. However, maps are handled separately, through their own storage and distribution system because of peculiarities which require an exclusive system.

(*a*) Bulk production, movement, and issue of maps are clues to the scope of forthcoming operations. Because of the security requirements, special and elaborate arrangements may be necessary to handle the map

issues prior to a large-scale operation, such as an amphibious or airborne invasion. In such cases, the entire map-distribution operation may be directly controlled by the engineer of the command.

(*b*) Changes as revealed by the constantly expanding sources of information may quickly render maps obsolete and may require several improved editions in the course of a single operation.

(*c*) Unlike other supply items, maps have a direct relation to the exact place in which the operation is to occur.

(*d*) In general, bulk stocks of maps cannot be prepared and distribution planned far in advance. Collection of source material for map production must be constant and worldwide. Production must be phased to insure the inclusion of the most current piece of terrain information which can be used. Issue can be made only after an exact assignment of mission has been made.

(2) Map supply is decentralized to the extent necessary to insure prompt and efficient service, and is the responsibility of the senior engineer of any command. Requirements are computed by the engineer under the staff supervision of G2. Requisitions are prepared and submitted through engineer channels in time to permit the reproduction and shipment of the maps required. Crash or emergency requisitions must be held to an absolute minimum, for a large volume of such requisitions will disrupt and destroy any reproduction program and map distribution system in a short time. Engineers of divisions and larger units are responsible for the distribution of military maps in the field, except such confidential and secret maps as may require special distribution. They obtain maps not printed by their echelons from the engineer of the next higher echelon.

g. Depots. Map depots are organized and operated at each echelon of command, down to and including corps. Map depots normally procure and make available bulk stocks to the depot of the next lower echelon. Base and advance depots are located in the TALOG with the advance depot near the forward limit of the TALOG. Base map depots receive and store bulk stocks from the AMS and base reproduction plants, break down and distribute bulk stocks to advance depots, distribute to base depot units, and operate a retail map store. Advance map depots receive and store bulk stocks from base map depots, break down and dis-

tribute bulk stocks to field army map depots, and operate a retail map store for the headquarters of units located in the area. The army map depot is located in the army service area, usually near army headquarters. In a fast moving operation it may be necessary to operate two map depots in the field army area which leapfrog over each other as the army headquarters moves on. The army map depot has functions parallel to those of the base map depot. It is operated by the map storage and distribution section of the army topographic battalion. The corps map depot is located in the corps rear area and has the same functions as the base map depot, but on a reduced scale. It is operated by a section of the corps topographic company. Operation of the division map stores is the responsibility of the division engineer who receives bulk stocks, distributes maps to divisional and attached units, and stores the division reserve map stocks. Detailed discussion of map supply and map depot operations are found in TM 5–231. Figure 6 is a general plan and may require modification to best fit a given situation or particular command.

108. Survey Support of Artillery

In addition to the survey requirements for mapping activities, the engineer topographic units have the responsibility of providing survey support for artillery, guided missile operations, surveillance devices, electronic installations, air defense artillery, and air installations. Even though artillery units normally have an inherent survey capability, engineer topographic survey support is required to supplement the artillery capability. Since engineer survey support capability is limited, only the highest priority missions should be assigned to the topographic units. The accuracy required for these surveys varies and the engineer at all echelons of command must be able to evaluate the type and amount of survey effort required. The engineer should also maintain close liaison with artillery commanders to determine just what artillery survey support is required. Accurate missile fire is dependent upon reliable ground control which entails exact determination of launching sites, azimuths, and target sites. The photomapping elements of units have a limited capability for siting weapons system and for locating terrain-type targets.

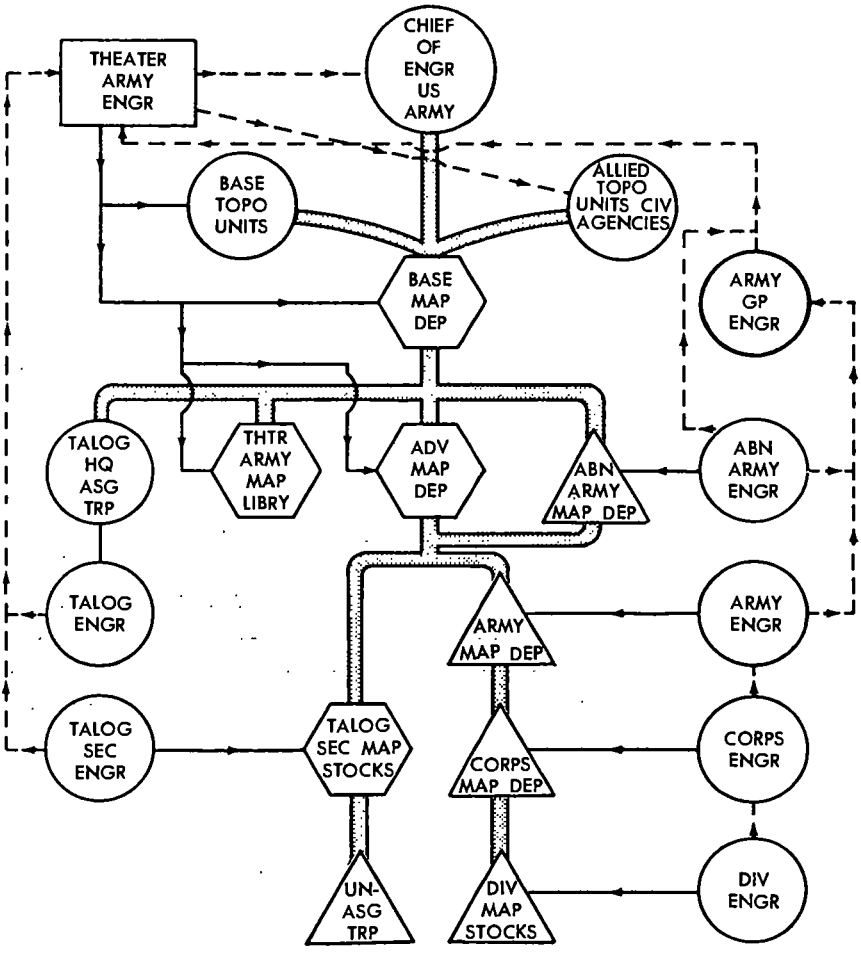


Figure 6. Flow chart.

CHAPTER 10
CONSTRUCTION OPERATIONS

Section I. GENERAL

109. Responsibility for Construction

Broad plans and policies for construction in the theater are established by the theater commander. They are based on coordinated planning by construction representatives of theater Army, Navy, and Air Force. The theater army commander establishes policies, standards, priorities, and scale of construction for his subordinate echelons, based upon recommendations of the theater army engineer. In turn, the theater army engineer furnishes staff supervision in the execution of theater army construction directives pertaining to all aspects of construction. The TALOG commander is responsible for Army construction throughout the communications zone. He exercises this responsibility through the commanders of the base and advance logistical commands and separate area commands.

110. Planning and Supervision

Within the theater army headquarters, planning and staff supervision of engineer construction is the responsibility of the theater army engineer. Major staff coordination is effected with the G4 and liaison with the Air Force with respect to requirements, acquisition, priorities, and material. Plans for construction are based upon requirements generated at subordinate echelons. Only very broad planning guidance, theater army-wide in scope, is initiated by the theater army engineer. He exercises his staff responsibility through technical channels by the exchange of information and through command channels in the form of orders and directives. Based upon current plans, the availability of both military and civilian construction supplies, the availability of civilian labor and construction capability, and the approved priorities for construction, the theater army commander allocates construction troops and materials to subordinate echelons.

111. Programing

The using services are responsible for enunciating their general requirements for construction of installations and facilities.

The commander establishes priorities of construction based on the recommendations of G4, which are obtained by coordination with the general and special staff sections concerned. This is the base on which engineer brigade or group commanders prepare detailed layouts and construction plans. Knowledge of the commander's construction policies and priorities should afford the engineer involved adequate means to conceive and implement a construction program. The demands for construction, however, usually greatly exceed the engineers' capabilities and are pressed so urgently that the commander's approval on specific major features of the construction program is essential. In this manner the engineer's program becomes the commander's program and the dilemma of assigning first priority and last priority to projects is avoided.

112. Contracting

a. General. In certain situations it may be possible to contract for construction or services in a theater of operations. The use of contract construction depends upon the military situation, the availability of indigenous contractors and materials and theater policy. It is usually necessary for the preparation of formal agreements concerning contractors, between U.S. Forces and the national authorities when operations are being conducted in friendly or allied countries.

b. Types of Contracts. The many types of construction contracts may be roughly classified as—

(1) Lump sum.

(2) Unit price.

(3) Cost-plus-fixed fee.

These types are suitable, generally, for operations in a theater but require an explicit statement of supplies and support to be provided by the contracting officer, and careful inspection to insure desired quality of performance.

c. Competition Among Services. The responsible engineer must insure that no competition arises among the Army, Navy, and Air Force, or Allies, for the services of contractors, as such competition reflects unfavorably on our own forces and reduces the effectiveness of contractors. If necessary, a joint contracting agency may be established.

d. Overhead. Contracting in a theater of operations normally requires a larger overhead of supervision and inspection to attain similar performance than does zone of interior contracting.

e. Local Practices. Adoption of local contracting practices

(method of reimbursement, wage scales, building standards and techniques) may facilitate administration of the contract; however, they should be scrutinized to insure that they do not conflict with good performance, and with current regulations modified within the bounds of authority permitted. In particular, the following practices should be avoided:

(1) Use of peacetime safety factors not warranted for military construction.

(2) Direct dealing between the contracting officer and the subcontractor.

(3) Open end maintenance contracts unless specifically authorized.

(4) Rebates from contractors are not tolerated.

(5) Near total substitution of cheap labor for faster, more economical production equipment.

f. Incentives. In a wartorn area currency alone is seldom sufficient incentive for good contract performance. The following incentives have proved successful in past operations: food, clothing, gasoline, surplus construction materials, housing, and an opportunity to keep a construction organization together.

g. Decentralization. During an occupation, decentralization of contracting authority, including authority for bartering, will greatly increase the volume of engineer work accomplished. Decentralization also discourages mess labor migration.

h. Coordination With Civil Affairs Agencies. Enforcement of contracts may require legal intervention and the responsible engineer must insure that the contracts comply with the technical requirements of the civil affairs agencies.

113. Indigenous Labor

Because the Corps of Engineers is one of the largest employers of local civilian labor in a theater of operations it has been common practice to assign immediate responsibility for civilian labor to the engineers. This responsibility reverts to a civil affairs agency as soon as practicable. Both prisoners of war and civilian labor are important factors in the total production effort in a theater and must be adequately and rapidly utilized through trained staff personnel. In an area of dense population the tremendous dislocation due to the war reacts strongly on the quality and capability of the labor supply. In areas of scattered population the necessity for the importation of labor creates its own special problems. These problems, as well as those incident to supply of food and clothing,

wage scales, organization, and general facilities must all be solved initially by the engineer officer responsible for the labor.

Section II. GENERAL CONSTRUCTION

114. General

The maximum scale of accommodations and facilities to be provided for forces in a given theater is specified by the commander, usually on recommendation of his staff engineer and G4. A guide for such construction standards is found is TM 5–301, and TM 5–302. During initial stages of development of any base, when supply of construction materials is most critical, and at locations where occupancy of only a few weeks' or months' duration is expected, it is the responsibility of the commander charged with the operations to reduce the scale of construction until it is commensurate with such conditions. Facilities and accommodations are intended to reach the maximum scale of development indicated in the above referenced manuals only where functional use of the base for more than 6 months is contemplated or where conditions make necessary certain semipermanent-type construction. In all cases construction should be held to the minimum necessary to accomplish assigned missions.

115. Principles Governing Military Construction

a. Construction should be accomplished within the allocated time, utilizing a minimum of materials, equipment, and skilled labor, with an objective of conserving our own natural resources and supplies.

b. Maximum use should be made of installations, and facilities described in TM's 5–301,, –302, and –303, the Engineer functional components system, and the Signal Corps coded facility system when they are applicable. These systems provide necessary drawings, plans, and bills of materials for a number of the most common and repetitive type construction tasks. They are appropriately coded for use with the Automatic Data Processing System (ADPS) and modernized supply procedures. Use of the systems facilitates construction planning, programing, and review; and the procurement, distribution, and control of construction material.

c. If new design is necessary it should be simple and flexible to provide for multipurpose use and future expansion of completed work.

d. Using services must express their anticipated needs well in advance of the actual needs to permit procurement of the necessary

construction materials and supplies, as most of the supply items required are class IV and are not normally in theater stocks.

e. The permanency of any structure erected should be only that consistent with military necessity at the time.

f. Existing facilities must be used before initiating new construction.

g. Only the minimum facilities consistent with true military necessity can be provided. In view of the extremely heavy demands on engineer effort and the tonnages involved in construction, economy of construction is most important.

h. Generally, a large project is completed in units to allow the completed parts to be used while construction continues. Cases will arise, however, particularly in the combat zone, in which time is the vital factor. In such case economy of manpower takes a back seat and the project should be completed in the fastest and most practical way. Production-line methods may be employed in some instances.

i. Underground or protected sites should be considered in the construction of essential facilities. Improvisation should be made whenever possible to reduce material requirements.

j. Facility planning should be of such a nature as to avoid creating lucrative nuclear targets.

k. Vague delineation of a project inevitably leads to confusion and friction. The engineer responsible should strive for an explicit understanding with the using agency, and, in particular, should point out borderline features not covered by the project plans.

l. Camouflage, where considered necessary, should be planned during initial sites selection and construction, as early consideration prevents excessive costs, limits destruction of existing terrain, and insures better concealment.

116. Protective Construction

Protective construction must be integrated into existing strategic, tactical, and logistic concepts and must provide balanced protection against all weapons effects which may be expected. Semipermanent protective facilities must be designed for continuous day-to-day operations rather than solely for emergencies. Engineer and other troop effort available for the construction of semipermanent shelters is at a minimum, making the use of civilian contract construction firms or indigenous labor and equipment effort necessary wherever possible. Maximum use should be made of existing facilities.

Section III. UTILITIES

117. General

Operation and maintenance of utilities, including power, water, heat, sewerage, and fire protection at large installations, such as hospitals and major headquarters, are best performed by utilities detachments (TOE 5–500), reporting to the installation commander. These utilities teams also accomplish repairs and minor construction within the installation, relieve the engineer of a mass of detailed problems, and give the installation commander quick action on small projects. Reconstruction and initial operations of municipal utilities in a large city of particular significance to our forces may be beyond the capabilities of utilities teams and therefore classed as major construction to be accomplished by the engineer construction units.

118. Special Considerations

a. The authority and responsibility of installation commanders to execute minor construction should be explicitly defined.

b. Control over the utilities activities of an installation commander may be exercised through project approvals, supply allocations, limitations on contracting authority, personnel ceilings, and budgeting of funds.

c. Procedures for supply of construction and repair materials, supply of solid fuels, and the loan of equipment to utilities teams must be explicit. Similarly, provision must be made for maintenance of engineer equipment in the hands of these teams.

d. Utilities personnel should be thoroughly indoctrinated through technical channels in the construction policy of the higher command. In addition, the engineer must provide technical assistance in appropriate cases.

e. Large portable or floating electric generator plants with capacities from 100 to 500 kw may be required because of increased consumption of electric power as needed for signal communications, control of guided missiles, electronic countermeasures, refrigeration, and battlefield illumination. In an emergency, electrical power may be supplied by large naval vessels for consumption on land.

Section IV. ROADS

119. General

Adequate roads are essential to large-scale military operations

and their construction and maintenance constitute the heaviest and most time-consuming responsibility of the engineers in a theater of operations. There is no engineer unit designed solely for road construction and maintenance, and the responsibility, demanding much time and effort, falls to a large proportion of the engineer units in a theater. Unless the responsible engineer resorts to all practical means to reduce the work load, and undertakes new construction only when absolutely necessary, the bulk of his engineer effort can be expended on road construction and maintenance. New construction usually can be limited to those projects paying large dividends, such as port egress highways, bypasses to relieve congestion, and depot roads; and maintenance can be limited to a carefully selected highway net. Much engineer time and effort can be saved if installation commanders are encouraged to accomplish as much of their own interior road work as is possible.

120. Characteristics

a. Although the engineering principles involved are unchanged, construction and maintenance of military roads differ from civilian road work in that the time factor, supply problems, and enemy action impose a greater range of problems and required modification of construction methods. Little construction of the degree of permanency represented by usual civilian practice is expected of engineers in a theater of operations. While in the forward areas the urgencies of the military situation usually require rough, hasty work designed primarily to meet immediate needs, and in the rear areas there is a limited requirement for construction of a more deliberate nature, most of the engineer road construction and maintenance falls in the middle of these two extremes.

b. Based on the tactical or strategic situation, higher authority dictates certain requirements or specifications when assigning a road construction mission. These include—

(1) *Time allotted for completion.* In forward construction speed is usually the dominating factor.

(2) *Type of construction.* For example, main supply route, fair-weather road for temporary traffic relief, etc.

(3) *Location.* Specific location should always be determined by a competent, trained engineer. Principal engineering factors for site selection are anticipated traffic, existing facilities, future expansion, obstacles, earthmoving requirements, topography, drainage, soils, availability of materials, and accessibility of the site.

121. Special Considerations

The following factors must be considered in all road construction work and are of particular importance in a theater of operations.

a. Economy of Time. The nearer the operation is to the front, the more vital the time element becomes. Time is saved by efficient use of manpower, power equipment, handtools, materials, and other available facilities.

b. Simplicity. Simple designs calling for available materials and requiring a minimum of skilled labor should be used.

c. Economy of Materials. Materials must be conserved, particularly those shipped from the zone of interior. Local materials should be used whenever practical.

d. Location. The location of new construction projects is normally dictated by military necessity. Existing facilities, however, should be used wherever possible to avoid unnecessary construction.

e. Safety and Durability. The factors of safety and durability of roads are not as important for military construction as for civilian construction. Factors of safety often are materially reduced in keeping with the small degree of permanence of the facilities constructed and in keeping with the inherent risks of war, saving time, materials, and manpower. Almost all military construction in a theater of operations should be considered temporary.

f. Planning and Management. Good planning, careful scheduling, and thorough supervision hasten job completion and effect economy of time, equipment, and materials. When the situation requires it, stage construction should be used to permit early use of the facility while further construction and improvement continue.

g. Terrain. Slopes, drainage, vegetation, character of soil, likelihood of floods, and other unusual conditions that may affect construction and layout should be studied. Dense brush, timberland, and rolling terrain that may require heavy clearing or grading are normally to be avoided in combat-area construction.

h. Air Defense Measures and Camouflage. Aerial attack on vital installations in proximity to the road site must be expected. The likelihood and effectiveness of such attacks, however, are often lessened by the selection of a site that gives protective concealment and by the use of antiaircraft weapons and camouflage.

i. Protection of Existing Facilities. In all construction, whether

in forward or rear areas, care must be taken to prevent destruction of or damage to existing facilities. Unnecessary damage to existing facilities, whether above or below the surface, will require repairs and an expenditure of time and manpower for exceeding that required to prevent such damage or destruction.

122. Reconnaissance

When roads are needed in a theater of operation it is almost axiomatic that these facilities should be ready for use as early as possible, as the need is usually critical. Good reconnaissance is the best time saver. This does not imply that exhaustive field investigations or elaborate plans are necessary, but adequate investigations of the site and careful study of the design details are essential for greatest economy in construction time and effort. In the preliminary reconnaissance it is possible that a few hours spent in soil investigations will save days in construction time. Finding a gravel pit easy to work and near at hand, or locating a rock ledge which might impede grading operations are examples of rewarding reconnaissance. The comparison of soil conditions on two possible sites requires extra effort in surveying, but may mean the difference between simple and difficult work. After site information is collected and the type of construction is determined, such details as establishing grade lines, location of work areas for different equipment, sequence of operations, procedure for compaction and the thickness of base and surface courses must be considered in relation to all possible solutions in order to select the proper one.

123. Highway Preventive Maintenance Measures

a. A command-wide indoctrination program stressing preventive maintenance of highways will reduce unnecessary damage resulting from careless driving practices.

b. The importance of drainage to road construction and maintenance must be emphasized in engineer troop training.

c. Snow and ice problems in a temperate climate are best solved by summer and fall procurement and reconditioning of snowplows, distribution of cinders, and similar preparations.

Section V. RAILROADS

124. General

Strategic, tactical, and logistical plans are greatly influenced by the rail transportation system, even in regions of moderate industrial development. New construction may be confined to

key projects such as depot yards, transfer points connecting two systems of different gage, short bypasses or sidings to eliminate traffic bottlenecks, port-egress lines, expansion of terminal facilities, particularly in regard to water supply and fuel storage, and short spurs to accommodate railway artillery and rail-transported launching facilities for guided missiles. Reconstruction is limited to the part of the system that is essential to military operations.

125. Responsibilities

Although AR 55–650 assigns responsibility for new construction and for reconstruction of railroad facilities to the Corps of Engineers, and responsibility for ordinary maintenance to the Transportation Corps, the engineer must be prepared to act on many borderline cases. In situations where the responsibility is disputed, the problem is referred to the command G4 for decision.

126. Special Considerations

The following factors may assist the engineer to anticipate special problems:

a. As a general rule, a type field army requires one double track line into its maintenance area.

b. The enemy may be expected to concentrate his demolition efforts on turnouts (switch points and frogs.)

c. Most railway bridging requirements can be satisfied by the simple steel-stringer type bridge supported on timber trestles or piles.

d. The Military Railway Service should have a voice in the supply control of engineer materials used both for construction and for maintenance (rail, turnouts, ties, etc.).

e. Native railway-operating personnel are a source of information on existing operation and supply facilities in a liberated area.

127. Reconnaissance

The surveys and studies and plans required for the construction of a railroad are more elaborate than those necessary for the construction of most roads.

a. Studies are made of the best available topographic maps to narrow the choice of routes to be reconnoitered.

b. Ground reconnaissance is made of the possible routes. Items to be noted include odometer and barometer observations of distances and elevations, general character of the terrain, control-

ling curvatures, soil and drainage conditions, bridge and tunnel sites, the size and character of bridges needed, intersections with railways or important roads, availability of ballast and other construction material, and points at which construction parties would have access to the railway route.

c. A preliminary survey is then made which includes cross sections along the feasible routes. Trial locations are plotted and adjusted to give the best balance of grades, compensated grades, cuts, and fills. This establishes or fixes the line of the railroad.

d. The precise line is then located by field survey parties and staked. This calls for much more precision than the location survey of most new roads, since the curves of a railway and superelevations must be accurately computed.

128. New Construction Principles

Except in the most primitive areas, the basis of the military transportation service in a theater of operations is the existing transportation network and its facilities, expanded as may be required to meet the total traffic load. All transportation in the theater must be organized into one system, each part supplementing the other, and all directed toward the theater requirements. The existing transportation facilities follow an economic pattern which may not correspond to the tactical plan. The logistical plan of support, however, is gravely influenced by the transportation as it exists, in that, maximum use must be made of the available system in order to expedite the operation. As in all other types of construction it is necessary that new construction be restricted to the minimum. Not only will such restriction reduce the material requirements but also the requirements for transporting the material will be lessened.

Section VI. AIRFIELDS

129. General

Road and airfield construction are similar. The equipment used, the sequence of operations followed, the methods used, and the types of construction employed are much the same. Both require the use of earthmoving and paving equipment, but airfields require a heavier concentration of this equipment.

130. Responsibilities

Refer to paragraph 53.

131. Special Considerations

The basic considerations given in paragraph 121 for road construction are applicable to airfield construction.

132. Reconnaissance

Airfield reconnaissance differs from road location reconnaissance not so much in the type of information sought as in its comprehensiveness. Ordinarily, an airfield project involves more man-hours, more machine-hours, and more material than a road project. Consequently, an even greater degree of certainty that the site selected is the best site available becomes economically necessary. Also, certain additional requirements are imposed on an airfield site by the operational peculiarities of flight. Just as roads must be both feasible engineering-wise and adequate to accommodate the vehicular traffic to which they will be subjected, so must airfields be both feasible engineering-wise and suitable for the air traffic which will use them. Here, too, the difference is one of degree. Air traffic by its very nature imposes more severe limitations on its traffic facilities than does vehicular traffic. Also, a history or record of wind velocities and directions is of paramount importance to airfields, while unnecessary for roads.

Section VII. BRIDGING

133. Responsibilities

The Corps of Engineers is responsible for the construction, rehabilitation, repair, and maintenance—except for routine maintenance of railway bridges which is within the capability of the Transportation Railway Operating Battalion—of all highway and railway bridges in a theater of operations.

134. Special Considerations

a. Economy of Time and Materials. Of time and materials, time is normally the least available in war and its economy is possibly the paramount consideration in the construction of military bridges. On the other hand, there is always an inherent shortage of construction materials in war and too free utilization of materials, to save time, in one locality or one one occasion may result in failure of a military operation in another locality at a later date. A balance of these two economies must be achieved by weighing all factors.

b. Mission. The mission of a bridge is the most important factor in determining the type of bridge to be constructed.

c. Permanency. The length of time for which the bridge is intended to be used should be considered.

(1) Temporary bridges are usually constructed in forward areas for the purpose of opening routes of supply for the assault troops, or to provide access to certain areas for a limited period of time. They are hastily constructed and replaced as soon as possible, or abandoned altogether. These structures are designed for a short life, normally not over 6 months. If it is possible, provision should be made for easy replacement. Temporary bridges may be either prefabricated or field designed. The prefabricated temporary bridges are designed to carry a given load and require a short time to construct. Their expense is justified by the decrease in erection time; however, they should be replaced as soon as possible, to enable the reuse of the prefabricated materials in the more forward combat area. The field designed temporary bridge most used is the simple stringer span timber trestle bridge. Logs or local materials are used in this type construction. Erection time is usually longer than that of the prefabricated bridges, but the logistical problems are greatly reduced. Simplicity and standardization of construction aid in rapid erection with a minimum amount of equipment and skilled labor.

(2) Semipermanent bridges are usually used to replace temporary structures and are intended to last for the duration of hostilities. The most common semipermanent structure is a timber or steel stringer span with either timber trestles or pile type supports. Time is not as critical in the construction of a semipermanent bridge as it is with a temporary bridge and the material and construction effort normally have a greater influence. The location becomes important. Semipermanent bridges are tied in with existing road nets wherever possible, rather than detouring vehicles excessively to permit a shorter bridge crossing. These bridges are required to carry heavier loads and may be constructed by noncombatant troops or civilian labor. With two exceptions—their less permanent nature, and the lack of consideration given to their appearance—these bridges are built in accordance with the recognized principles of civilian bridge construction.

(3) Permanent bridges are sometimes built in the rear areas along main routes. Very special circumstances may jus-

tify the decision to use this type of construction. In such construction, the equipment and materials available and the skill of the personnel, rather than the time element become the most important consideration.

d. Materials. Prefabricated fixed and floating bridge components as well as the standard family of beams and girders are used for tactical bridging. Depot stocks are conserved by the use of portions of existing bridges left in place or on site, and the utilization of materials developed by cannibalization of existing building for beams, timbers, and bracing. Strategically important material is stockpiled to be readily available as replacement.

e. Design. Designs for various types and sizes of military bridging are prepared and published by the Department of the Army. A theater headquarters may prepare and issue designs intended to utilize local materials and skills, simplfy construction, or meet special load requirements. Officers responsible for the design and construction of bridges in a theater should adhere as closely as possible to standard designs unless there is good reason to depart from them, in which case the responsible engineer headquarters must do its own designing. This policy should not, however act as a barrier to making any changes which would expedite work or economize labor or materials. For the techniques involved in designing a bridge, or computing accurately the strength and capacity of an existing bridge, see TM 5–260.

135. Site Selection

a. In many cases there is little choice in the selection of a bridge site. New bridges are frequently located at the site of a destroyed bridge in order to utilize existing routes, abutments, piers, or spans which may still be in good condition. Usually an existing site was originally planned to provide the most economical bridge at the best location. It may be necessary, however, to remove debris if the enemy has destroyed the old bridge and if the destruction was complete the removal of the debris may be more time-consuming than the development of a new site. These considerations must be weighed in each individual situation.

b. Technical considerations such as soil conditions, height of banks, and stream data also affect the time required for construction. The principal site conditions which must be considered in determining the most economical bridge are—

(1) *Soil conditions.* The choice of a foundation for an intermediate or end support depends on soil conditions. The major considerations are the soil capacity and the pos-

sibility of scouring action. Normally the easiest and quickest type of foundation to construct is a spread footing; however, if there is a tendency to scour, piling is preferred. Spread footing may be used if adequately protected with rip rap, sheet piling, or cribs. On soils of low bearing capacity spread footings are often inadequate and piles will have to be employed.

(2) *Banks.* A low, flat, and marshy approach, or one subject to flooding demands either a very long bridge, or a causeway over the flood plain, with a bridge over the stream. As a general rule it is better to use a causeway in conjunction with a bridge when the fill is less than 15 feet. Over 15 feet it is usually easier to use a longer bridge. High banks necessitate either tall intermediate supports, or a cutting down of the approaches to a practical grade—an operation which can involve much time. High banks are not a great disadvantage for gaps that can be bridged with a single span.

(3) *Stream data.* The velocity, depth, and width of the stream and the effect on the proposed bridge must be considered. The best bridge sites are generally found on straight runs where there is less tendency to scour, and the stream is usually narrower. Flood frequency and level must be considered in determining the height of the roadway. Piers that cause the least obstruction to the flow of water and debris should be used, and in some cases must be designed for stability against the forces of floods, debris, or ice. A thorough investigation of civilian bridges in the vicinity, and consulation with the natives provide a sound basis for accurate estimation of unusual stream conditions. Navigational clearance generally need not be considered. If a river or canal, however, is used to bring supplies by barge, provision should be made for the movement of river traffic.

136. Construction Principles

a. The construction of a bridge must be well planned and personnel and equipment must be used efficiently. A construction schedule is helpful in insuring the latter, by showing the number of men and the amount of equipment required, as well as their disposition throughout the project. The extent to which the construction schedule is developed depends on the time available.

b. Standard designs, material sizes, methods of construction, and training are useful and economical in military practice. It

is desirable to regulate the supply and stockpiling of materials and avoid too large a variety of sizes and shapes timber, steel, and other materials. A limited variety of materials aids in standardizing designs, construction details, and methods of construction, and results in a repetition which promotes a high degree of skill in the construction personnel.

c. While it is almost always more economical from a time standpoint to use completed prefabricated bridge structures, it is almost never more economical from a logistical standpoint. Therefore, prefabricated bridges are normally replaced by field-designed bridges when the tide of battle has moved on and time and materials are available. Many details of field designed bridges may be standardized, resulting in advantages normally associated with prefabricated bridges.

Section VIII. PORT CONSTRUCTION AND REHABILITATION

137. General

The obtaining of adequate ports early in any oversea operation is so vitally important that one of the initial objectives of a campaign is to secure them. The construction of new ports is undesirable as it requires a large amount of manpower, materials, and time and probably would lack the desirable urban community at or near the site. Generally, temporary ports and landing facilities are used in the initial phase of an invasion and abandoned as soon as established ports are captured and rehabilitated. It is improbable that an existing port will have the precise facilities needed and if it has been under enemy control will probably be badly damaged. Therefore, construction at ports in a theater of operations consists of repairing, rebuilding, enlarging, or adding new facilities. This type of construction differs from other construction in that much of it is done in and over water. In the construction of port shore installations, such as warehouses, roads, and railroad track, standard military construction procedures are followed.

138. Responsibilities

a. General. The operation of a port in a theater of operation is a large and vital undertaking, with many divisions of responsibilities between the Navy and the service forces within the Army. Basic decisions as to the location of ports, capacity, utilization, wharfage, and storage facilities are made at theater headquarters and TALOG headquarters level. The numerous units involved are coordinated through a port commander and staff of

a port headquarters and headquarters company, an organization of the Transportation Corps (FM 55–25). The Transportation Corps is responsible for operating ports and furnishing liaison with the Navy, Coast Guard, and other interested military and authorized civilian agencies, both of allied countries and the United States. The Corps of Engineers is responsible for the construction and maintenance of new ports and the rehabilitation of captured ports. This responsibility includes minor salvaging operations, such as clearing obstructions and debris from harbor entrances and channel improvement, but does not include large-scale salvaging, which is a Navy responsibility. The Transportation Corps requests, advises, and makes recommendations concerning engineer troops employed and the work concerned.

b. Engineer Responsibilities. In the construction of ports the engineer is normally charged with the following duties:

(1) Construction and repair of breakwaters, docks, piers, wharves, quays, moles, and landing stages.
(2) Reconstruction of utilities and clearance of debris within the port area.
(3) Necessary dredging.
(4) Repair of roads and railroads within the port area.
(5) Firefighting.
(6) Acquisition of buildings, facilities, and other property within the port area for military use.
(7) In a large port expansion or rehabilization operation engineers must provide warehouses, depots, quarters for transients and port personnel, tank farms, roads, railroads, and utilities. Such a project is usually under an engineer construction group which has, in addition to the specialized port construction units, construction battalions, dump truck companies, and other units as needed.

139. Special Considerations

a. Essential to successful port reconstruction is careful planning based on extensive and detailed port reconnaissance. Reconnaissance should be conducted throughout the action up to actual occupation, for though initial planning may have been completed prior to occupation, last minute enemy may render the plans obsolete. Other equally important factors to be considered in port reconstruction include the availability of necessary construction materials and special nonorganic equipment, such as dredges, lighters, barges, cranes, diving equipment, pile-

drivers, and floating shops. The order and shipping time on these items may be 3 months or more.

b. Because of mines and demolitions, unloading capacities are nearly always extremely limited immediately following the capture of a port area, while, at the same time, the demand for supplies for direct support of combat operations may be urgent. The engineer can do little to improve this situation until considerable tonnage of his reconstruction materials and equipment is unloaded. Unloading priority is therefore a commnad decision based on the situation.

c. Planned structures should be based on the simplest type of construction such as timber piling, or timber trestles, in order that materials may be readily adapted to unexpected conditions.

d. Under favorable conditions timber piling and lumber may be rafted over short distances directly to the worksite to conserve shipping.

e. Waterline facilities are usually provided in the following order:

(1) Ramps for landing craft and amphibious vehicles.

(2) Beach roads.

(3) Marginal piers for shallow-draft vessels.

(4) Berths for deep-draft vessels.

f. The best interest of the overall operation may be served by partially operating port structures simultaneously with their reconstruction, even though such operations hinder the engineer effort.

g. The ultimate capacity of a port is more frequently limited by its highway and rail-egress facilities than by its waterside facilities.

h. A physical apportionment of areas of a port between two allied forces or between the Army and Navy should be avoided since it requires much coordination, particularly in regard to rehabilitation and operation of common facilities, such as utilities and rail yards.

i. Technical assistance on highly specialized matters such as electrical circuits, operation of tidal locks, operation of existing cargo, handling equipment, and information on foundation conditions may be obtained from local port authorities. Prisoners of war may be a source of highly skilled labor.

j. A liberal proportion of the personnel making up port reconstruction units should be drawn from civilian construction firms

experienced in this type of work. Even then, however, the units require extensive training.

Section IX. PIPELINES

140. General

Enormous volumes of liquid fuels are consumed by a large military force engaged in active operations, imposing a difficult problem of storage. Pipelines with rates of flow closely approximating the consumption rates of using units not only reduce storage requirements, but are the most economical means of transporting large quantities of bulk liquid fuels.

141. Responsibilities

The Corps of Engineers is responsible for all construction and the rehabilitation of military pipelines, including associated installed facilities (discharging, loading, pumping, and storage) and for field maintenance of engineer mechanical equipment components of military pipelines. Since ship transportation of POL products is handled by Naval Operations Group 422, the engineer coordinates with the Navy on problems involving ship-to-shore lines. Storage facilities within an installation, such as airbases and naval bases, may be constructed by engineers, but are operated by troops under the control of the installation commander. Distribution priorities frequently involve coordination with allies, and are normally controlled by the Joint Petroleum Office (JPO) of the theater commander's staff.

142. Special Considerations

a. Operation of pipelines for the distribution of bulk petroleum fuels within a theater is accomplished by the Petroleum Intersectional Service (POLIS) operating under the staff supervision and normally the operational control of the Quartermaster TALOG.

b. Construction of pipelines will normally be under the staff supervision of the TALOG engineer. Construction units of BALOG, ADLOG, and the field army are capable of pipeline construction. A construction force under the operational control of the TALOG engineer may also be employed for the execution of this mission.

c. Close coordination between the engineer and the Air Force must be effected as the Air Force is one of the largest consumers of liquid fuel and has area control over its own installation.

d. New items of equipment such as jet planes, reaction motors, and guided missiles may introduce problems in the handling and storage of special fuels such as kerosene, alcohol, or turpentine.

e. The design, layout, and construction of a pipeline system is an extremely specialized and complex matter. The engineer may require on his staff a specialist experienced in commercial practice.

f. The location of QM dispensing facilities should be planned along with the layout of the pipeline system.

g. Special aircraft, such as helicopters, may be employed for patrolling lines, and for rapid delivery of pipeline construction materials and collapsible rubberized fabric storage tanks to isolated worksites.

h. The need for camouflage and dispersion of tank-farm facilities is great. Protective construction may be required in some cases.

i. Desert operations may require a separate pipeline for water.

j. Multiproduct pipeline operation (using same line for several fuels) will be the normal method of operation.

k. Useful and essential control data, aerial photography and intelligence data should be obtained from engineer mapping and intelligence sources when determining the best location of pipeline systems.

l. Pipeline operations are the responsibility of the QM Corps and, since the QM Corps takes beneficial occupancy, close coordination during planning and construction phases is necessary.

CHAPTER 11
SUPPLY

Section I. INTRODUCTION

143. General

a. The supply problems of the Corps of Engineers are closely related to its missions, for, in accomplishing its construction and rehabilitation responsibilities, it is the major consumer of the items for which it has logistic responsibility. It differs in this respect from most of the other technical services. Over 60 percent of engineer supply falls into class IV for projects ranging from construction of a port with all the necessary dock facilities, roads, and structures, to the preparation for the supply and installation of flood gates for a reservoir. Execution of these projects involves careful logistical planning and coordination among diverse elements. Since these projects are frequently the end result of an emergency situation, the planning time is often limited. The Corps of Engineers has developed a Functional Component System to meet the need for a rapid requirement-computing system for both individual projects and for a major portion of the class IV supply effort.

b. Because of the large number of makes and models of mechanical equipment, the number of repair parts which must be maintained and supplied is enormous. To reduce the magnitude of the problem, the Corps has under development a family of small size military-type engines, has standardized makes and models of equipment by area, has effected procurement standardization, and has adopted a system of assemblage replacement as opposed to individual parts replacement.

144. Responsibilities

a. In the chain of control of engineer supply, the high echelons plan and develop the broad policies. Subordinate staff echelons implement these policies, control critical items, control the flow and distribution of stock items, and exercise staff supervision over engineer depot activities. Supply responsibilities rest on the theater, theater army, army, corps, and division engineers, and on all engineer unit commanders.

b. Within levels prescribed by the Department of the Army, and in accordance with instructions and policies of theater and theater army, TALOG is responsible for theater inventory of army items. The TALOG engineer has staff responsibility for inventory control of engineer items to include, requirements computations, on-hand quantities, and long-range planning. Reliable data, especially for the major items, must be maintained as a basis for determining the various requirements, not only to complete the initial equipment and reserves of the items themselves, but also to aid in the establishment of repair parts stocks, and other maintenance needs.

Section II. SUPPLY REQUIREMENTS

145. General

Supply requirements are defined as a statement of all the supplies needed for the equipment, maintenance, and operation of a force for a particular period of time or to complete a specific project. For accurate planning and to insure the availability of proper types and adequate quantities of supplies best suited to the climate, terrain, types of troops employed, and the nature of the operations, the TALOG engineer staff must be informed, as far in advance as possible, of strategic and tactical plans. Conversely, the army group engineer staff must be advised, equally far in advance, of the types and quantities of supplies available, or planned for procurement, to meet the needs of projected operations. When special equipment, not authorized in TOE's, is required it must be known or estimated far enough in advance to insure procurement and availability for the operation.

146. Initial Equipment Requirements

Inital equipment requirements are those equipment allowances for the engineer unit prescribed by TOE's, TA's, EML's and similar authorities. Requirements personnel on the engineer staff must obtain, or prepare and keep current, periodic statements of these requirements for completing shortages in the initial equipment, and for computing replacement, consumption, and reserve requirements. In an oversea command, the computation of these initial equipment requirements depends upon a knowledge of such factors as: the troop basis and the allowance authorizations under which the troops and installations are to be supplied; the status of equipment in the hands of troop units; and the date of arrival or activation of troop units, or the date on which supplies are needed for their installations. The engineer must obtain basic data for computation of these requirements from the general staff, which

includes, in addition to the above factors, the period of time for which computations are to be made, and the inventories or estimates of other services.

147. Replacement and Consumption Requirements

The demand for replacement and consumption is based on that part of the initial material allowance which is worn out, consumed or replaced through wear and tear, and losses under combat conditions. It is computed by applying to the total items in use a "replacement factor", which gives the proportion of replacement required per month for each unit. The determination of the replacement requirements for engineer replenishment, in accordance with the replacement factors furnished by DCSLOG, Department of the Army, is an engineer function. The theater army engineer must establish means of forecasting theater requirements at the earliest possible date, since Department of the Army planning for procurement of major equipment items has a lead time of from 6 to 14 months. The engineer must coordinate with the general staff sections of the headquarters to obtain the information for forecasting engineer supply requirements far enough in advance to meet demands of contemplated operations. Experience data must be compiled by the engineer staff to increase the reliability of the factors used in determining the requirements for sustaining the operations.

148. Theater and In-Place Reserves

Reserve stocks are the quantities of items prepositioned in a theater to sustain M-day and early deployment forces in the event of emergency or surprise attack. Additional reserve stocks may be prescribed for particular purposes, such as class IV projects, equipping task forces, evacuating dependents, and equipping newly activated organizations. Reserves of engineer supplies are computed by the engineer staff, and require approval of theater DCSLOG, Chief of Engineers, and Department of the Army. Reserves are developed during peace time and are designed to support class II and class IV operations.

149. Project System

a. General. The project system is the medium whereby commanders may obtain supplies to accomplish the assigned mission supporting logistical, operational, and contingency plans. There are two general classifications—*theater projects*, and *Department of the Army-prepared projects.* Theater projects are further subdivided into: operational, development, and maintenance projects, and, when approved, provide the authority for the oversea

commander to obtain the required items. Department of the Army-prepared projects are studies of projected military operations and developments, initiated by the Department. Theater projects support emergency plans, whereas, Department of the Army-prepared projects support a campaign plan based upon an assumed M-day.

b. Requirements. Project requirements normally are considered to involve class IV supplies only. An approved project requirement is one which has been authorized by the Department of the Army for supply, including necessary procurement. Project requirements include bills of materials, available stocks, and statements of shortages. Complete bills of materials are prepared by heads of technical services within the theater. The functional component system may be used by the theater engineer in the development of project requirements. The class IV supply requirements are—

(1) Operational project requirements, if they provide additional equipment or supplies for tactical operations.

(2) Development project requirements, if they pertain to the construction, reconstruction, development, or remodeling of military installations, utilities, or facilities required to support military forces or activities in theaters.

(3) Maintenance project requirements, if they provide class IV supplies for day-to-day maintenance of installations, facilities, or utilities that are required to support oversea forces and military operations.

c. Projects Requiring Special Consideration. Projects requiring special consideration include—

(1) Base installations, including depot, shops, assembly areas, port facilities, hospitals, rest areas, military confinement facilities, prisoner of war inclosures, army exchanges, and postal systems.

(2) Railway or highway rehabilitation or construction.

(3) Office equipment, reproduction equipment, and vehicles for headquarters and other administrative installations.

(4) Firefighting equipment.

(5) Operational equipment needed for special tasks or where unusual losses are expected and cannot be met by normal maintenance.

(6) Bridging, airfield construction materials, petroleum products distribution systems, and water supply.

(7) Barrier plans, e.g., field fortifications, camouflage.

Section III. LEVELS OF SUPPLY

150. General

Levels of supply which are authorized to be on hand in the theater are prescribed by the Department of the Army after consideration of recommendations of the theater commander and directives of the Department of Defense. It is necessary to convert these levels into quantities for each item. The supply levels prescribed by the Department of the Army for a theater of operations cover the total stocks held in the theater, including those held in army depots. Supplies authorized to be in army supply points and in the hands of using units are additive to theater levels. The supply levels or quantities of an item held in the theater are based on the replacement factors or consumption rates. If appropriate Department of the Army replacement factors or consumption rates are not available, temporary factors are established, based on experience and anticipated future activities. It is important that the necessity for levels of supply be understood thoroughly at the time such levels are established. The theater army engineer constantly makes use of all available information to analyze theater levels, requisitioning objectives, and replacement factors, to insure that current and anticipated demands are accurately reflected at all times. Supply levels are normally expressed in days of supply and classified as—

a. Safety Levels. The safety level of supply is the quantity of supplies, in addition to the operating level, required to sustain operations during any anticipated reasonable interruption of supply lines. The minimum level for a theater is prescribed by the Department of the Army and is considered as a reserve to be drawn from when supplies required to replenish the operating level (described below) are delayed, or are temporarily inadequate.

b. Operating Levels. The operating level of supply is the quantity of supplies required to sustain operations between replenishment shipments. This quantity is based on the established replenishment period.

c. Retention Stocks. Retention stocks are the quantities of supplies authorized to be retained in the theater, over and above the safety and operating level, for economic and strategic reasons.

151. Stockage Objective

The stockage objective is the quantity of supplies authorized to be on hand to sustain current operations. It is the sum of the

safety level and the operating level. The stockage objective is stated in Department of the Army directives.

152. Order and Shipping Time

To maintain oversea command stocks, within the operating range between authorized safety levels and approved stockage objectives, it is necessary that requisitions be initiated in time to keep on order and/or in transit sufficient quantities of supplies to cover the time interval between the requisition action by the oversea command and the material receipt. This time interval is known as *order and shipping time* and is established by the Department of the Army.

153. Requisitioning Objective

The oversea command requisitioning objective is the quantity of material authorized to be on hand and on order to sustain current operations. It consists of the sum of the stocks represented by the operating level, the safety level, and the order and shipping time. The requisitioning objective for each item stocked in the command is used, with other factors, as a basis for restoring stocks in the command to the extent of the stockage objective. Theoretically, the proper computation of requisitioning objectives and the phasing in of shipments permit maintenance of stocks in the command above the safety level, without exceeding the stockage objective.

154. Factors in Establishing Stock Levels

The factors to be considered in establishing stock levels for individual supply installations are—

a. The supply level prescribed for the combat zone.

b. The location and mission of each supply installation, and the number and type of units it supports.

c. The normal order and shipping time for each installation, and the regularity or irregularity of resupply.

d. The character and relative importance of the combat missions of the tactical units being supported by each installation.

e. In establishing stock levels, armies and similar major commands, in coordination with TALOG, may utilize order and shipping time, and increase requisitioning objectives accordingly, with respect to any class of supplies being requisitioned at established periodic intervals, wherever the relationship of actual order and shipping time to the authorized stock level is a substantial factor.

155. Computing Requirements

The computation of requirements considers the expected increases or decreases in theater troop strength, the stockage objective, the order and shipping time, seasonal requirements, dues out, theater and inplace reserves, projects, and special operational requirements.

Section IV. SHORTAGES IN AUTHORIZED SUPPLIES

156. Computation Procedure

Shortages in supplies are computed by subtracting quantities on hand from the overall authorization or approved overall requirements for the theater or command. In determining onhand quantities, consideration is given to quantities in the possession of units or installation, in army or similar stocks, quantities in transit, and dues-in (quantities previously requisitioned). The overall requirements include quantities for initial issue as shown in TOE's, TA's, and EML's; replacements or replenishments; projects; dues out; stockage objective, order and shipping time; seasonal requirements; reserves; special operation requirements; and retention stocks. The computed shortages or overages then become the basis for requisitioning, procurement, or disposition of excess.

157. Required Department of the Army Approval

Allowances other than those established by TOE's, TA's, and similar authorities, and those over which the theater specifically has been delegated authority, require Department of the Army approval. This system is established to facilitate management and control at the procurement level to insure a base for computing replacements, and supervision of scarce or critical items on a worldwide basis.

158. Prevention of Shortages

Authorization for special issues within the theater are carefully controlled, particularly for those items in short supply. Lack of such control may create imbalances in replacement and consumption computations and result in unnecessary shortages, emergency requisitions, and waste of premium transportation.

Section V. SUPPLY CONTROL

159. General

The supply control system provides the media for computation

of requirements, the accumulation and application of assets, and the direction of procurement, requisitioning, rebuild, or excessing of supplies and equipment. The supply control function is performed by the inventory control point under the direction of the theater engineer.

160. Basic Elements

The basic elements of a supply control system are—the supply policies of the command; asset reports, forecasts of requirements, issue experience; availability of supplies at stated periods in the future; and knowledge of all factors affecting the past, present, and future supply status of individual items.

161. Stock-Control Consideration

Stock control is discussed in FM 100-10. The stock control system of records and reports through which pertinent data are maintained on the quantity, location, and condition of supplies due in, on hand, and due out, provides much of the basic data for the accomplishment of supply control.

162. Cyclic Supply Control Analysis

Supply control analysis must be applied to each line item on a periodic or cyclical basis. As a result, a considerable staff of qualified technicians must be secured and trained for this duty. These technicians must have a practical knowledge of the characteristics and uses of the items which they analyze, and must interpret stated requirements and expected receipts of these items in the light of past experience, probable effect of future operations, and the capabilities of the logistical system. It is estimated that one supply control technician can adequately analyze and initiate supply action on a cyclical basis on approximately 300 items. Special consideration must be given to critical and major equipment items. Since it is expected that a major theater will handle up to 10,000 different items of engineer supply (excluding repair parts), an engineer supply control office for the theater will require 30 to 40 supply control technicians.

163. Analysis of Items

a. Critical items are analyzed to ascertain their status as required, normally once a week. Important, but less critical items are also analyzed as required, normally once each month. The great bulk of items can usually be managed with a bimonthly or a quarterly analysis.

b. Since the number of minor end items and repair parts in the supply system will lie between 100,000 and 200,000, supply control

analyses procedures for these items will normally be reduced to a mechanical basis and computed by ADPS. It is advisable, however, to place the more expensive critical assemblies, such as engines and tractor tracks, under an analysis procedure similar to the procedure for major equipment.

Section VI. PROCUREMENT, REQUISITIONING, AND CONFISCATION

164. General

In general, supplies are acquired by a theater of operations either by shipment from military sources outside the theater or by exploitation of resources within the theater. Military sources outside the theater may be the zone of interior, other theaters, or allies. Examples of local resources which may be exploited are local stocks, agricultural products, manufactured goods, captured material, and reclamation of worn, damaged, or discarded equipment and supplies. Local resources are utilized to the utmost to save time, transportation, and national resources.

165. Supply From the Zone of Interior

Supply from the zone of interior on a requisition basis is the ideal method of insuring that an oversea command receives those items which are required to provide balanced stocks, but the method can almost never be used in the initial months of a campaign. Order and shipping time of from 3 to 4 months does not permit shipments to be made during this period in accordance with requisitions based on actual local requirements.

a. Automatic-Supply Phase. During the first months of operation in a new theater, supply usually is made from the zone of interior on an automatic basis, without requisition. Troops going into the new theater are accompanied by their initial equipment and supplies for replacement and maintenance for a given period of time. The Chief of Engineers supervises shipment of replacement and maintenance supplies periodically and automatically, in accordance with prescribed directives and prearranged schedules. Project supplies are also shipped automatically. In addition, supplies to meet emergency needs are called for by radio, as required. As the oversea command progressively gains control over its supply functions it furnishes to the Department of the Army available supply status information as a basis for modifying the automatic flow of items and securing a more balanced stock position. According to the interim capabilities of the oversea command, such supply status information may vary from simple

reports of losses and reports of local procurement to inventory data necessary for complete material status reports.

b. Normal Requisition Phase. Normal requisitioning procedure is established as soon as possible. The date on which automatic supply is cut off is prescribed by the Department of the Army, based on recommendations of the theater commander, to insure all supply agencies taking concerted action. This is necessary, not only to prevent duplication of shipments, but to avoid a break in supply.

c. Requisitioning Procedure. Requisitions for supplies from the zone of interior are prepared and submitted periodically in accordance with the policies and directives of the Department of the Army (see AR's 725–5 and 725–8). All requisitions for the theater, except those for Air Force supplies and equipment, are prepared and forwarded by TALOG to the Overseas Supply Agency (OSA) at designated ports of embarkation in the zone of interior. Chiefs of OSA are responsible for processing these theater requisitions to the appropriate supply source for action, and notifying the theater of shipment and expected date of arrival at destination. When the Corps of Engineers is unable to supply an item by the time requested, TALOG is furnished a notice of delayed items through the OSA. This notice of delayed items includes information concerning the expected dates of availability for the items involved. In the event that the requisitioned item is not available in the zone of interior and if for any reason it will not be procured, a notice of nonavailability is furnished the requisitioning agency, along with recommended available subsitute items, if any.

d. Critical Shortages. Shortages may make it necessary for the Department of the Army to exempt certain critical items from requisitioning procedures at any time. All theaters may be required to submit status or loss reports showing overall requirements, on hand or en route quantities, shortages, or losses. The available supplies are then allocated by the Department of the Army, and the Chief of Engineers supervises automatic shipment of engineer items in accordance with prescribed priority. Alternatively, the theater commander may be informed of the allocation and authorized to call the articles forward by requisitions that direct shipment to specific ports in his theater.

166. Procurement From Local Sources

Procurement from local sources within a theater of operations is to be utilized fully, particularly when the theater of operations is overseas or in a location deficient in lines of communication

(AR 715–30). A systematic large-scale procurement program requires the establishment of field agencies to perform inspection and acceptance functions, supervise crating, marking, documenting and transportation, and to assist suppliers in obtaining raw materials allocations, facilities, and payment. Troop units are neither organized nor trained to function as procurement teams. An ideal arrangement is the use of real estate and procurement teams for this purpose.

a. Procurement Considerations. When procuring items from local resources, consideration is given to the arrangements made with allied governments and to the needs of the local population. Local resources to be utilized include not only supplies available from local production, but such services as transportation, utilities and facilities, including manufacturing installations, and billets. The engineer supplies most suitable for local procurement are solid fuels, engineer construction material, and other large-tonnage items.

b. Procurement in Hostile Areas. Material resources in captured enemy territory may be obtained by purchase, requisition, contribution, or confiscation. Purchase is the obtaining of supplies and services in the prescribed manner, using United States currency. Requisition is a demand made of the inhabitants and differs from purchase in that prices are usually fixed by the buyer with the owner having no option. Under the rules of land warfare, many things may be requisitioned. Requisitions may be in proportion to the resources of the country, but not of such nature as to force the inhabitants to take part in military operation against their own country. Property requisitioned is paid for either in cash or restored with suitable indemnification. If this is not done receipts are given, subject to later redemption. Requisition of supplies is accomplished by specially detailed foraging direct from individuals, or by systematic collection. Foraging usually is resorted to only for the supply of advanced troops or small parties. Best results normally are obtained through requisitions on local civil officials by the supply services of large units. Contributions are the results of demands or levies or taxes for money. Confiscation is the authorized seizure of property of a hostile country for public use without compensation. Procedure for utilization of local resources in the theater of operations is prescribed by the theater commander in conformity with the law, rules of land warfare, and regulations of higher authority. Unauthorized seizure of property is punishable as looting.

c. Procurement in Friendly Areas. When the theater of opera-

tions is in CONUS or friendly territory, supplies are obtained by long-range financial arrangements, or direct cash purchases.

d. Central Purchasing Agencies. These agencies may be established to supervise, coordinate, and control all procurement in a theater of organization, and are headed by general purchasing agents on the staffs of appropriate commanders. The agent arranges with appropriate officials of the local government for the procurement of needed supplies and services. He also has the authority to establish policies and regulations governing direct cash purchases by the supply services. Actual purchases are customarily made by engineer purchasing officers rather than by the purchasing agency. Ordinarily the agent establishes a list of centrally procured supplies comprised of items which are required in great quantities, are very expensive, or require materials or facilities which are critical to the civilian economy. He permits no local procurement of these items except as authorized and strictly supervised by him.

e. Utilizing Local Resources. In utilizing local resources, determining civilian needs, locating hidden resources, and establishing liaison with civilian agencies, the engineer must coordinate his activities with the civil affairs authorities.

167. Repair of Supplies and Equipment

Recovery of supplies and equipment through repair is effected by restoring item to serviceable condition and returning them to the supply system for reissue. To be an effective source, the quantities of each unserviceable item on hand and the repair parts required to place them in serviceable condition must be closely integrated into the stock-control system. The projected availability of items from this source can then be balanced against requisitioning or procurement from other sources.

168. Captured Material

A valuable source of logistical support consists of all captured enemy equipment and supplies. To insure maximum utilization, commanders must issue specific instructions to capturing units regarding prompt reporting and safeguarding of such material. When the nature and quantity of captured material warrant, appropriate service elements must be immediately dispatched forward to relieve combat units from guarding and controlling responsibilities.

169. Salvage

Salvage consists of recovered material which can be used for

its original purpose either with or without repair, and material which can be converted to a substitute use or which has value as scrap. Salvage material, especially arms and ammunition, falling into the hands of civilians may gravely endanger rear area and line of communications security. The prompt collection of equipment and other material which has been abandoned on the battlefield and in bivouac areas, and the utilization of waste materials are important measures in the conservation of military resources. Salvage operations make available substantial quantities of arms, equipment, and supplies for reissue, conserve labor and materials, and afford relief for shipping, rail, and highway transportation.

a. Responsibility. The responsibility for the collection of salvage does not rest solely on service units, but on every member of the Armed Forces. Unit commanders are responsible for salvage discipline, including collection and movement of salvage to collection points, situated along routes of communications. At division level and higher, collection and recovery of salvaged engineer material are continuous and important functions of the engineers. Some engineer equipment salvage, particularly sniperscopes, tools, and compasses, will be originated by the battlefield-collection activities of quartermaster salvage units. The engineers are responsible for having such items promptly inspected and classified, and insuring that serviceable and repairable items are promptly removed to engineer supply and maintenance installations. Depending upon the quantity of such equipment handled by the engineers, specialized units may be used and collecting points established, or normal engineer units may be designated to establish collection points. Salvage is a responsibility of the engineers as long as salvaged items can be used for their original or similar purpose by repair or modification.

b. Salvage Organization. The salvage service of the theater of operations consists of units engaged wholly or partly in the collection, evacuation, classification, and disposition of waste materials, abandoned materials, and unserviceable supplies. Installations of the salvage service include collecting points and reclamation plants and shops. In emergencies, combat troops are detailed to assist in collection.

c. Salvage Procedure. The engineers designated to support the using units establish collecting points for appropriate types of material in favorable locations on road routes to the rear. Empty vehicles moving to the rear are utilized to transport material to these collecting points. Engineer units must assist in the collection and evacuation of heavy salvage material particularly in fast-moving situations. Items pertaining to another technical

service collected by engineer units in the course of their operations are turned over to the nearest collecting point of that service.

d. Inspection, Sorting, Rehabilitation, and Restocking. Engineer storage and maintenance personnel inspect and sort salvage at collecting points, returning the serviceable items to supply points for redistribution. Repairable items are evacuated to the appropriate engineer unit for repair and return to stock. Items which cannot be repaired by field maintenance companies are evacuated to the designated depot maintenance unit in the TALOG. Items which are not repairable are evacuated to designated reclamation establishments in TALOG. Captured enemy equipment is handled in the same fashion, except that samples of new equipment are turned over immediately to engineer technical intelligence. Material which has been classified as scrap, and any other items which have no value except for their basic content, are turned over to the activity designated by the theater commander as responsible for the disposition of surplus property.

Section VII. REGULATED ITEMS AND COMMAND-CONTROLLED ITEMS

170. General

Regulated items are those articles which are scarce, costly, or of a highly technical or hazardous nature, and which must be controlled closely during and after distribution.

171. Regulated Items

a. The Department of the Army periodically publishes lists of regulated items. An item on the list can be deleted only through the action of the Department of the Army. The theater commander exercises close supervision of issues of regulated items on individual requests to insure distribution in accordance with existing priorities. Requisitions for regulated items are processed through command channels with intervening commanders recommending issue priority only for units under their control. The theater commander determines at what command level various items can be approved for issue.

b. In addition to regulated items, commanders at all echelons may control other items which are in short supply or critical in nature. In so doing, they normally publish controlled items lists or directives which require the same general procedures for obtaining such supplies or equipment as for regulated items. Items are added to or deleted from the list only by the commander who published the list.

172. Apportionment of Regulated Items

Based upon the existing and future situations, the recommendations of subordinate elements, and the recommendations of the theater army engineer, the theater army commander apportions engineer items on the regulated and the command-controlled items lists among the major commands, in accordance with the availability data provided by TALOG. Such apportionment is governed by, and kept consistent with, the priority system established in current theater instructions and directives. Major commands are advised of the quantities of such items apportioned, and within each major command, the control of engineer regulated and command-controlled items is exercised by the commander, based on recommendations and staff supervision of the engineer and appropriate coordinating staff officers.

173. Solid Fuels

Solid fuels, such as coal, coke, wood, and peat, because of their bulk and weight are procured locally under established policies whenever possible. Distribution and issue are in accordance with the general principles for distribution and issue of other supplies, and priority is given to hospitals, railroads, essential military and civilian utilities, manufacturing installations, communication centers, and headquarters. The Corps of Engineers is responsible for procuring, storing, and issuing all solid fuels, but class III engineer solid fuels are not usually stocked at depots. Wherever possible, delivery is arranged from source to consumer. Distribution is made by the port operation agencies at the direction of the engineer supply control officer, who maintains records of consumption in order to program future requirements. The port authorities process the documents necessary to insure receipt of the products by the responsible party. The physical handling and the storage of coal for railroad use is usually delegated to the Military Railway Service.

CHAPTER 12
MAINTENANCE

174. General

There are three factors which add to the complexity of engineer equipment maintenance. First, engineers are charged with the maintenance of an extremely wide variety of equipment items. Second, although efforts for increased standardization are being made, there is always a practical limitation regarding the establishment of military standard engineer equipment because of the necessity for using commercial items. The wide range of equipment items combined with limitations on standardization give rise to multiple makes and models of equipment to meet the same functional requirements. This creates the necessity of stocking a greater range of repair parts for repairing each of the different makes and models. It also poses operator and maintenance training problems to insure personnel are familiar with the peculiarities of the various makes and models. Third, experience indicates that each major operation generates new requirements and workloads differing from that indicated by data derived from past experience or preconceived from study.

175. Responsibilities

a. General. Every member of the armed forces has a definite maintenance responsibility for the material that is directly or indirectly under his control. These responsibilities vary from preventive maintenance operations, to highly specialized repair and reconditioning techniques, to supervision and inspection. Equipment operating personnel, technical maintenance experts, and commanders of all echelons must prevent the deterioration of and insure the efficiency of all engineer equipment.

b. Command and Staff Responsibility. A large portion of the mechanical equipment in a theater of operations is engineer equipment. Commanders at all echelons are directly concerned with the use and maintenance of this equipment in their commands. Staffs of all intermediate commands, such as groups, battalions, separate headquarters, and corresponding Air Force and Navy commands, plan, train, inspect, and coordinate to in-

sure proper use and maintenance of engineer equipment within their commands.

c. Unit Commanders. Unit commanders are responsible for the performance of operator and organizational maintenance of the equipment under their command. Some engineer units are authorized a TOE capability to perform partial or complete field maintenance on organic or supported equipment. The commander has responsibility for maintenance and parts support commensurate with his maintenance echelon capability. Unit commanders conduct command inspections, and schedule technical inspections of equipment in their units. They are responsible for proper operation of the equipment under their command and for the prevention of equipment abuse. They enforce safe operating rules and traffic regulations, and are responsible for the proper execution of all forms, records, and reports concerned with operation, maintenance, and inventory of equipment. They procure and distribute technical literature, training manuals, repair parts, maintenance tools, and establish maintenance facilities to aid in discharging their maintenance responsibilities.

d. Dual Responsibilities. The engineer maintenance structure is coordinated with the maintenance procedures of other technical services. The Corps of Engineers has the responsibility for field and depot maintenance of all army engineer equipment used by nonengineer units and activities. On many items of equipment a dual responsibility for maintenance exists. *For example,* the Corps of Engineers has organizational, field, and depot maintenance responsibility for the compressor assembly on a compressor, air, truck-mounted in an engineer unit, and organizational maintenance responsibility for the truck chassis, while the Ordnance Corps has field and depot maintenance responsibility for the chassis. To insure continuous operation and proper maintenance of these types of equipment, close coordination between the engineer and other maintenance organizations is vital.

176. Procedures

a. Maintenance Echelons. Repairs are performed at the lowest echelon of maintenance consistent with the nature of the repair, the availability of repair parts, tools, equipment, and time; the skill of personnel; and the tactical situation. This saves transportation and places equipment back in operation in the shortest time. No echelon of maintenance, however, performs the work of a higher echelon at the expense of performing its own assigned functions.

b. Contact Repair Service. It is often more practical and

normally more expeditious to move maintenance personnel to the equipment than it is to move the equipment to the maintenance personnel. For this purpose a contact repair service provides mobile repair parties consisting of mechanics with repair parts and special equipment. In addition to repair, these parties render all possible assistance by inspection, replacement of components, and by giving technical advice on all items of engineer equipment to the using troops. It is normal for direct support maintenance units to give close contact service to supported troops.

c. Supply Requirements. An adequate supply of repair parts, assemblies, and tools must be available if maintenance units are to operate at maximum efficiency. Each unit is authorized a supply of repair parts, assemblies, and tools commensurate with its maintenance responsibilities, and the replacement of these items is accomplished through maintenance and supply channels.

d. Direct Support and Heavy Maintenance Companies. Direct support maintenance companies normally repair equipment for return to the using organization. Heavy maintenance companies normally perform fourth echelon maintenance of engineer equipment and overhaul of certain components of end items for return to depot stock. They also support engineer direct support companies by performing overflow third echelon maintenance.

e. Maintenance Work for Other Services. Within their capabilities, engineer maintenance organizations perform work on material other than that pertaining to their own service when the authority to perform this maintenance is specifically assigned as part of the unit's mission. The success achieved in the repair of equipment of other technical services, however, is contingent on arranging for efficient supply of repair parts from the technical services involved.

177. Organization of Maintenance Support

a. General. Maintenance units are disposed both laterally and in depth to offer the best possible service to the equipment being maintained. Direct support maintenance units remain sufficiently close to units being served to give close contact support, but with due consideration to the tactical situation, terrain, cover, and concealment. As far as practicable, direct support maintenance units support the same tactical units throughout an operation. This improves liaison, understanding, and cooperation between supporting and supported units. Maintenance shops and facilities, once established, remain in operation in the same locality as long as tactically practicable without sacrificing service to

supported units. This principle is particularly applicable to units performing depot maintenance. Depot maintenance, if performed in the theater, is confined to the base logistical commands. Depot maintenance is curtailed in oversea theaters in time of war (FM 100–10).

b. Combat Zone. Usually the units in the combat zone perform first and second echelon maintenance on the equipment they use. The infantry and armored division engineer battalions have the additional authorization for performing third echelon maintenance for all the engineer equipment in their parent division. Certain other engineer units may also be authorized by their TOE to perform third echelon maintenance on organic engineer equipment. Maintenance support for these units is provided by engineer direct support maintenance companies, maintenance detachments, or composite maintenance and supply organizations. Maintenance units also supply the necessary repair parts to the supported units. When direct support maintenance companies, operating in corps, have heavy maintenance loads or are unable to complete repair within the allotted time, they may evacuate part of their disabled equipment to heavy maintenance units or depot shops. Other direct support maintenance companies furnish maintenance support to engineer equipment in the army areas.

c. Communications Zone. The number of direct support maintenance companies in a communications zone depends on the number of pieces of engineer equipment to be supported, and the number of pieces each company can support. Capabilities of maintenance units are outlined in their appropriate TOE's (app. II). The theater engineer, based on recommendations of TALOG, recommends the number of engineer direct support companies and other maintenance teams required. The number of heavy maintenance units required in the communications zone varies in proportion to the number of direct support maintenance companies assigned to the theater of operation. Maintenance of lower echelons is organized in the same manner in the communications zone as in the combat zone. Using organizations generally perform first and second echelon maintenance. Certain other using units have the capability authorized by their TOE's to perform partial or complete third echelon maintenance of organic or supported equipment. In all instances, the using units are provided repair-parts support and higher echelon maintenance support through the direct support maintenance companies. Fourth and fifth echelon support to direct support maintenance companies is supplied through the heavy maintenance companies.

d. Isolated Areas. In areas where units are isolated from

normal field maintenance support, field maintenance detachments should be attached to the using unit. Repair parts support and backup maintenance is furnished by the nearest field or depot maintenance company.

178. Special Considerations

a. Current records of equipment population are always fundamental to a sound maintenance program. Such inventories include data on manufacturers' names and models, serial numbers, pertinent dimensions, and types of fuel and lubricants used.

b. A high degree of centralization of storage and control of repair parts is extremely desirable, however, defensive dispersion does not allow concentration of all repair parts in one place. Generally, two or three large repair parts depots should serve a theater.

c. If only a few specialists are available in any particular maintenance activity, the maximum benefit is derived by organizing them into visiting teams whose mission is to inspect, advise, and instruct. In many cases, these teams will be required to perform on-the-spot maintenance.

d. The assembly of equipment at a port or in a depot frequently requires engineer equipment maintenance teams.

e. Whenever practicable, replacements of entire assemblies such as generators, starting motors, fuel pumps, and engines will simplify maintenance at certain levels. The unserviceable assemblies must be evacuated through maintenance channels for repair and return to stock as replacements.

f. To prevent a decrease of construction effort resulting from unservicable engineer equipment, the direct support maintenance units preserve a stock of like serviceable items. The quantity of the float will be determined by the population of items within the area and the type of construction effort envisioned.

g. Equipment in the hands of units which requires depot maintenance should be replaced in the most expeditious manner. Turn-in equipment is accompanied by a requisition for replacement items. This procedure requires close coordination between the depot and maintenance units.

h. Salvage and cannibalization as a source of repair parts is covered in FM 100–10 and appropriate army regulations.

i. Detailed maintenance guidance and procedures are covered in TM 5–505.

CHAPTER 13
WATER SERVICE

179. General

Adequate water service for a military operation is a vital and fundamental necessity. In addition to that water required by personnel engaged in an operation, water is needed in large quantities for the mechanized equipment, as well as being required for the performance of some essential activities, such as processing of aerial reconnaissance photography and the manufacture of ice.

180. Responsibilities

Responsibility for developing and supplying water in the army is shared by the Corps of Engineers, Army Medical Service, Quartermaster Corps, Transportation Corps, and the unit commander.

a. The Corps of Engineers is responsible for supplying treated water for all purposes to all Army units. It is responsible for the design, procurement, installation, operation, and maintenance of water supply equipment. It also makes reconnaissance, develops sources, and transports water to distribution points. It works closely with the Army Medical Service to insure that the water is safe.

b. The Army Medical Service determines whether or not water is potable. It inspects water points and sources, and conducts water tests. It also makes studies and recommendations, in cooperation with the Corps of Engineers, concerning the design and selection of water purification equipment.

c. The Quartermaster Corps is responsible for the procurement, storage, and issue of individual and small unit water storage containers (canteens, 5-gallon cans, and canvas water bags) and individual emergency sterilization supplies.

d. The Transportation Corps is responsible for the rail and marine transportation of water in bulk, and for establishing and operating boiler-feed water supply points required for its own rail and marine operations.

e. The unit commander insures that all units and individuals

of his command have the required amount of potable drinking water at all times and enforces strict water discipline, i.e., drinking of approved water only, conservation of water, and protection of water sources.

181. Reconnaissance

a. General. Reconnaissance for water sources and development of water points is a special engineer responsibility and is concerned with the quantity and quality of water, accessibility of the proposed site, and the conditions of the site itself. Even after a water point has been established, reconnaissance should continue to locate alternate points in case the established point becomes unusable. This is especially true in fast moving situations. See TM 5–700 for the possible sources of information which aid in the selection of water points.

b. Quantity. If a stream is the source, the flow can be computed by any one of several methods (TM 5–700). If it is a well, a drawdown test can be made, time permitting, by pumping water at a known rate. Local inhabitants supply reliable information if time does not permit computation tests.

c. Quality. The quality of water is always suspect, and should be checked for color, turbidity, odor, taste and possible sources of pollution. Drainage areas should be reconnoitered as thoroughly as possible for possible pollution by human or industrial wastes, carrion, or poisoning by the enemy. Standard water quality control kits permit residual chlorine tests, p^H determination, coagulation tests, and turbidity tests. There are special kits for testing water possibly contaminated by CBR warfare.

d. Road Nets. A water point should have a road system connecting it with the users, and should be as close to a main supply route as is possible without interfering with the movement of traffic. Isolated locations should be avoided. There should be an all-weather access road leading to the point of storage, with a turnaround or a separate one-way exit. Trucks waiting to be filled should have an all-weather off-road parking area.

e. Site Conditions. In regard to conditions of the proposed site, reconnaissance is concerned with the available cover afforded, proximity to profitable targets, drainage, and bivouac areas for the operating party.

f. Seasonal Variations. If the proposed water point location is to be in use for a relatively long period of time, possible seasonal variations in the water source supply should be investigated. A

study of the surrounding area plus information from local inhabitants will reveal any extreme variations in the sources.

g. Municipal Systems. In addition to the above, when applicable, reconnaissance of an existing municipal system is concerned with complete information on the source, collection and transportation to treatment plans, the type of treatment, plant layout, operation, pumps, distribution system, and storage. Maps and sketches aid in showing locations of the components of the system and the treatment process.

182. Special Considerations

a. It is desirable to designate the water point to be used by an individual unit.

b. When water is scarce, a rationing system will be necessary.

c. The relative importance of the problems encountered at each site and the tactical situation determine in what order improvements are to be made at a water point. Development often requires use of troops and equipment not assigned to water supply units.

d. Water points must be just as mobile as the unit they are supporting.

e. Water points located along traveled roads interfere with normal traffic if off-road facilities are not provided for loading.

f. The route to water points should be marked by signs posted by water supply personnel.

g. Adequate drainage is essential as water points are continually wet. If mud is allowed to develop the point may become unusable.

h. Provision should be made for physical security. If the point is not concealed by natural growth, artificial camouflage will be necessary. Also, since tire tracks reveal the location of distributing points, the points should be located as far as possible from the treating equipment.

i. In populated areas municipal systems are used unless damaged beyond repair.

j. Elaborate development of a water point should be avoided. A temporary water source should not be converted to a permanent point until the area has been reconnoitered for a source requiring less effort.

k. Distribution of water is a major consideration in the operation of a water point and varies depending on local conditions.

For large quantities pipelines are used, water tank trucks and trailers are employed to supply dry points. Small quantities may be distributed in 5-gallon cans by truck and trailer.

l. Water point reports must be submitted on the daily production and distribution of water as they are the basis for top level planning involving the problems of water supply.

CHAPTER 14
REAL ESTATE

183. General

Real estate, in relation to army military activities, includes—land, buildings, and wharves, office and storage space, rights-of-way—or easements, and any interests which may be acquired or held for use by or benefit of the United States. It also includes equipment, appliances, fixtures, or supplies that are so attached or fixed in place that their removal would damage the property. Under the provisions of international law, a nation cannot own land in another nation, limiting acquisition in a foreign theater of operations to lease and rental in allied territory and to requisition, confiscation, and seizure in enemy territory. The method of acquisition and administrative procedures to be followed depend on geographical location, civilian needs, density of population, whether the territory is in allied or enemy possession, and the policies of the theater commander. See TM 5–300 for a complete discussion of real estate operations in a theater of operations.

184. Responsibilities

a. The Chief of Engineers is the Department of the Army staff officer responsible for all real estate functions, and he exercises staff supervision at the Departmental level over unilateral Army real estate activities in oversea commands. He is responsible for providing technical advice and assistance; initiating and maintaining the recording and reporting systems; issuing instructions; conducting inspections and staff visits to insure that oversea real estate activities are conducted properly; and reviewing oversea real estate data, including estimates, justifications, records, and reports.

b. The commander of a theater of operations is responsible for all real estate activities within the theater. He may delegate his authority to a designated deputy or to the theater army, navy, or air force commander, normally the commander having the greatest requirement. If the theater army commander is assigned responsibility for all real estate operations he may redelegate this responsibility to the TALOG commander, along with such real estate support as may be required by combat commanders, or he

may retain control and redelegate responsibility for rear areas only.

c. Staff supervision of real estate operations is a responsibility of the theater G4. The theater engineer is charged with the operating functions.

d. Engineers of commands below the theater army engineer are responsible for furnishing technical real estate guidance to their commanders, staffs, and subordinate echelons of the commands. They are also responsible for such other real estate duties as may be assigned or subdelegated to them by the theater army engineer.

e. Theater engineer real estate teams are responsible to the theater army engineer for conducting real estate operations within their assigned areas in accordance with the directives, instruction, and standing operating procedures issued by higher headquarters.

185. Objectives

A successful real estate administrative program will not be achieved unless all echelons, both engineer and nonengineer, are indoctrinated in the basic objective to be achieved. These objectives may be stated as follows:

a. To provide each unit of the command those real estate facilities essential to its mission.

b. To insure compliance with the rules of land warfare.

c. To minimize the requirements for construction.

d. To protect the local population against unnecessary hardship, damage, looting, vandalism, or wasteful utilization of property by United States and allied forces.

e. To provide property owners a reasonable recompense for their property and to avoid exorbitant claims against or costs to the United States and allies.

186. Acquisition

a. Allied Countries. Acquisition of real estate in friendly countries in the name of the United States is always by lease or rental agreement, and is handled through the designated authorities in each country in accordance with local diplomatic and economic requirements. Normal procedure requires the using service to file requirements with the staff section representing the theater engineer on real estate matters. This agency processes the requirements through the designated authorities of the country who select suitable sites and arrange with the owners for release of the properties. Payment for rental, as well as for

damages is accomplished in accordance with the agreements between the two countries. Generally, an inspection and survey is made and damages agreed upon. Usually, all relations with owners is the responsibility of the local government.

b. Enemy Territories. Acquisition of real estate in enemy territory is made in accordance with the rules of land warfare based on Hague Convention Number 4, commonly referred to as the Hague Rules (TM 5–300).

187. Procedures

The method of procurement depends on the policy of the theater commander. Purchase, requisition, and seizure are the methods used by the United States Army in hostile territory. Due to military necessity, all real estate required for use by combat units is normally seized or confiscated. If the buildings or areas desired are vacant, the unit moves in and takes over. If they are occupied, local authorities are advised what buildings are required and directed to have them available at the desired time.

188. Reconnaissance Site Board

a. When time permits, Site Boards should be established representing the using service, signal office, and the engineer office, to consider sites for large installations, such as hospitals and depots. Factors to be considered include area required, adequacy of water supply, accessibility to routes of communication, suitability of terrain, local labor, materials, signal communications and any other specific consideration. In the absence of a Site Board, the using service conducts its own reconnaissance and requests the desired real estate.

b. All real estate matters are coordinated by the designated engineer agency responsible for processing the necessary forms, and keeping records on all real estate transactions.

189. Allocation to Using Agencies

Whenever it becomes necessary to divide an item of real estate between two or more using elements, an allocation is necessary. The assistant chief of staff G4, or Director of Services, is responsible for supervising this allocation. His action is based on the facts of the particular case, which are submitted by the interested engineer officer and the user.

190. Disposal

Real estate, when no longer required for military purposes, is promptly returned to its owner. A detailed survey and inventory

is made of all property both before occupation and upon vacating. Upon vacating the using agency is required to explain any damages or deficiencies to the engineer officer handling the transaction.

191. Records and Reports

Records and reports on real estate outside CONUS are made in accordance with TM 5–300. It is important that complete, accurate information be maintained on the property to avoid controversy when the property is returned to the owner. Some of the important elements are: the condition of the property when taken over; quantity and condition of installed property; and quantity and condition of removable property. It is desirable to preserve duplicate copies of basic real estate records in super-secure locations.

192. Checklist of Real Estate Interests

There are many and varied real estate "interests." The following checklist of the common phases of "interests" most frequently encountered are provided, for inclusion in agreements, as necessary and applicable.

a. Roads. When main and access roads are designated, there should be clear statements as to load limitation, repair responsibility, maintenance, and traffic control responsibility.

b. Rights-of-Way. Clear agreement is required as to rights of the United States to all types of rights-of-way for signal, pipe, or power lines.

c. Water Supply Sources. The capacity of the water source and the amount that can be used by U.S. forces should be determined. Civil Affairs agencies coordinate if there is joint use by both the military and civilian population. Authority for U.S. forces to correct contamination is vital to maintaining a potable water source. The effect of drought and joint use should be clearly stated in the agreement.

d. Utilities. Right of entry to local electric, gas, water, sewer, pipeline, surface drain, or stream and water course right-of-way, or easement, for purpose of repair, maintenance or improvement should be determined. If U.S. owned or financed equipment or materials are installed on a privately owned utility, right-of-way, or easement, rights of ingress and egress must be retained by the U.S. forces.

e. Sanitary and Surface-Water Outfall Drains. The rights or interests that the U.S. Forces have or acquire in areas below the terminus of the drain, both as to land and water, should be covered by protective agreement or easement. If the sanitary outfall will

contaminate civilian water sources below the terminus of the drain, steps must be taken to protect the United States from future claims.

f. Railroads. The rights of the U.S. forces to connect spurs from the main or nearest rail line to the U.S. installations and areas should be clearly defined. The status of the easement or right-of-way lying between the boundary of the U.S. installation and the railroad right-of-way should be clarified and specific. Maintenance of the right-of-way, both within and without U.S. installations, should be determined if constructed by the railroad. Right-of-way and ingress and egress for maintenance and repair should be decided on before beginning construction.

g. Rights in Waters Bordering U. S. Installations. Security requires that limitation of traffic and use of water surfaces (coastal, tidal, and/or navigable) bordering U.S. installations be added to protect future U.S. interests. Police power over this bordering water surface can be extended if the water surface is a U.S. installation. This applies equally to wharves over-the-beach land (or maneuver) areas, island (used for storage), etc.

h. Ammunition and POL Storage Areas. When the U.S. forces are not able to obtain sufficient area in compliance with quantity-distance safety criteria, protective easements or rights-of-way agreements should provide protection against claims for injuries or damage within the U.S. installation.

i. Telecommunications. Rights of ingress and egress to public thoroughfare should be provided for all isolated radar, microwave, or similar electronic equipment, and to all areas within central exchange or repeater stations which provide interconnection of U.S. forces long lines.

j. Overwater Firing Ranges. Agreements covering overwater firing ranges should provide for: police powers before, during, and after firings; responsibility for publication of firing dates and hours; responsibility for removing duds; responsibility for posting the area; and a clear understanding of liability for strays, shorts, overs, and defective ammunition wherever the requested areas are restricted, limited, or reduced by the local government.

k. Local Use of Training or Maneuver Areas. When the local population or the military forces or militia of a foreign country enters U.S. forces training and maneuver areas for the purpose of farming, or harvesting, or when military forces or militia enter such areas for military training, the permit of use should "save the United States harmless" for claims for injury or damage.

l. Airfield Approach Zones. When additional land is acquired

for runway extensions, agreements should also provide for the height restriction in the runway approach zones lying outside U.S. installations. Coordination with the Air Force is required if it is an Air Force installation.

m. Navigable Water and Docks. When navigable waters required for egress and ingress to U.S. wharves, or beach facilities are subject to silting and filling, the agreement should contain, where possible, responsibility for dredging, maintenance, and navigation markings, lights, and aids.

n. Rights in Event of Labor Picketing. One of the most important real estate interests is the right to maintain ways of ingress and egress to U.S. installations in the event of picketing by local labor unions. Intergovernmental agreements or understandings are required on this particular problem.

CHAPTER 15

REAR AREA SECURITY AND REAR AREA DAMAGE CONTROL

193. General

a. The sources of danger in rear areas include: airborne drops, armored penetrations, amphibious landings, infiltration, sabotage, and guerrilla attack. Also bombing and strafing by conventional and nuclear means plus CBR warfare delivered by long range artillery, aircraft, and guided missiles. The enemy's ability to strike within these areas with little or no warning requires that commanders give special attention to—

(1) Security of the army service areas, with particular emphasis on lines of communication and installations required for the administrative support of operations.

(2) Rear area damage control which minimizes the disruptive effects of enemy attack or natural disaster.

b. The term *rear area,* as discussed in this chapter, pertains primarily to the field army service area and the communications zone. The principles of real area security and area damage control, however, also apply in the area forward of the corps rear boundary.

194. Responsibility

Active air and naval defense is provided for the entire theater and is the responsibility of the theater commander or major component commander as directed. Field army and communications zone commanders are responsible for the general security of their respective areas. Each installation and unit commander is responsible for the local defense of his own unit area or installation and will, within his ability, take appropriate action against all types of security threats. The local security of air and naval bases is the responsibility of the appropriate service. For details covering security threats and security measures see FM 100–5.

195. Organization

a. Field army commanders establish a rear area security control center and appoint a rear area security controller who is

responsible for assisting in the planning, and for organizing, supervising and controlling rear area security and rear area damage control operations within the army service area.

b. Within the communications zone, the TALOG commander will establish a similar organization responsible for rear area security and rear area damage control.

c. Rear area security and rear area damage control measures are applicable within corps and division boundaries but are usually supervised through normal command and staff channels.

196. Command and Control

a. General. Army and communications zone commanders normally retain command of all assigned combat and service troops. The utilization of either tactical or service troops in a manner which detracts from their ability to perform their primary mission is a command decision.

b. Rear Area Security. Combat troops assigned rear area security missions under approved security plans execute those plans upon order of the appropriate commander, with the rear area security controller supervising and directing the execution of such plans for the commander.

c. Rear Area Damage Control. Service troops with rear area damage control missions prescribed under an approved rear area damage control plan continue to operate under the operational control of appropriate technical and administrative service chiefs. Upon implementation of approved rear area damage control plans, those portions of service units which have damage control missions are directed and supervised by the rear area security controller.

d. Communications. Communications required for rear area security and rear area damage control are provided from equipment and facilities available to headquarters and units involved.

197. Rear Area Security

a. Enemy action in rear areas is characterized by surprise, deception, and mobility, necessitating a closely integrated and controlled defense to offset the attacker's advantage. This control and coordination is achieved by the commander through the rear area and subarea controllers. In organizing the defense of the area, the rear area security controller depends primarily on units permanently located in the area for execution of defense plans.

b. Military forces located in rear areas may consist of—technical and administrative service units; combat units stationed

in the rear area for security of the rear area; combat units in transit, in reserve, and in rest areas; air defense units; personnel replacements; and Air Force and Naval troops. The rear area security plans of units located outside the geographic area of responsibility of their parent headquarters conform to the rear area security plans of the headquarters controlling the area in which the unit is located. Commitment of such a unit to rear area security operations is directed by the headquarters controlling the area in which the unit is located, but only after prior coordination with the parent headquarters of the unit.

c. Training of administrative units includes instruction in infantry weapons and tactics; practice alerts; and tactical exercise to include training in defense against guerrillas, infiltrators, and saboteurs. Seldom are there sufficient combat troops available to secure the entire area simultaneously. Combat units should not be utilized to garrison static defensive positions or to protect installations. The limited number of combat units available for rear area defense is normally held under centralized control to provide a mobile reserve and patrol. The type and strength of combat units allocated depend on the size of the area, enemy capabilities, terrain, and available forces.

d. Civilian personnel may be used, as well as local and national police forces, whose value lies in their familiarity with the population and terrain.

e. Information is essential to the conduct of rear area defense. Intelligence sources include intelligence agencies from air force, navy, air defense artillery intelligence service, and special intelligence agencies available to the army or TALOG commander.

198. Rear Area Damage Control

a. General. Rear area damage control is a form of passive defense and consists of the measures taken prior to, during, and after a mass-destruction attack or a natural disaster. Damage control does not embrace the responsibility for the reestablishment of disrupted administrative support—this remains the responsibility of the appropriate commander using his technical and administrative services.

b. Measures Taken Prior to Disaster.

(1) *Dispersion.* Installations and facilities must be so disposed, when possible, as to prevent concentrations which offer profitable targets.

(2) *Cover and concealment.* Every means must be used to deceive the enemy and prevent him from attempting to destroy logistical installations. Engineers are respon-

sible for rendering the necessary technical assistance for all camouflage measures taken.

(3) *Duplication.* Duplication is a division of an installation into two or more parts, each part able to function with little additional administrative support. This duplication by division is another way of reducing the attractiveness of a target.

c. *Measures Taken During and After Disaster.*

(1) *Control of personnel and traffic.* The most important problem during and after a major disaster is the control of personnel and traffic. The military police are trained to do this and their responsibilities include rerouting supply convoys from the disaster area to the alternate logistical installations; permitting no traffic to enter the disaster area other than that connected with the rescue effort; and giving instruction to traffic that is permitted to cross radioactive areas, which include the routes to take, the speed of crossing, stay times, etc. Traffic control straggler lines are established to collect personnel within the target area who have been separated from their units, and who must be returned to their units, if they exist, or reassigned to another unit.

(2) *First aid and evacuation.* First aid and evacuation of patients are of prime importance. All military personnel are trained in first aid techniques. Every means of transportation is utilized to evacuate the patients from the area to patient sorting stations and/or to hospitals. The functions of rescue, first aid and movement of patients to sorting stations must be performed by non-medical troops in the area since there are usually insufficient medical troops to perform these functions plus the subsequent necessary treatment and evacuation. The surgeon provides the required number of medical service teams to man sorting stations together with hospital facilities to care for the tremendous number of patients that can be expected in a mass destruction attack.

(3) *Protection from CBR.* Protection from chemical, biological, and radiological attack is mandatory for all personnel. With an aggressor who has the capability of launching such attacks every precaution is taken to counteract his efforts. Decontamination teams are utilized to clear critical areas, supplies, and equipment.

(4) *Firefighting.*

(*a*) *General.* In heavily built-up areas firefighting is con-

ducted in a similar manner as in fighting forest fire. Because of the excessive demands for their services, TOE firefighting units will not normally be available and firefighting teams organized from available units must be prepared to control fires. The primary duties of these firefighting teams are the evacuation of troops and equipment and the isolation of fires allowing them to burn themselves out.

(*b*) *Responsibilities.*

1. Commanders are responsible for cammand and technical supervision of fire prevention and fire protection activities throughout their respective areas.

2. Area fire marshals, appointed by the area commanders are responsible for carrying out the commander's program.

3. In the theater of operations it is the responsibility of major commanders to indoctrinate all military personnel in the fundamentals of firefighting and fire prevention. All units should be trained as auxiliary fire teams to handle fire equipment for the protection of installations and personnel. Dispersion makes this imperative. In addition to the technical advice and inspections of the engineer fire marshals, demonstrations and instruction by teams from engineer firefighting organizations aid in unit training.

(5) *Provision of food, clothing, and water.* Provision of food, clothing, and water is made for both military personnel and affected local civilian population. Engineers are responsible for the supply of safe and decontaminated water (ch. 13).

(6) *Bomb disposal.* Bomb disposal is performed by the Ordnance Corps. They are mainly concerned with the disposal of conventional ammunition within the target area although they are able to handle any nuclear weapons that require disposal.

(7) *Salvage.* Salvage is an important operation in damage control activities. Each technical service sets up a salvage collection point, or a composite collection point may be organized. Every effort is devoted to returning all usable equipment and supplies back to the supply chain in the interests of supply economy.

d. Damage Control Units. A subarea or sector damage control

plan gives specific missions to the units within its subarea or sector.

(1) Heavy rescue teams are normally furnished by engineer units and ordnance maintenance units since these are units most likely to have the required dozers, cranes, air compressors, and other heavy equipment. Engineer units vary so in their composition and structure that it is impossible to establish a single criterion in regard to the rescue teams they are required to provide. Heavy rescue teams from construction-type units are provided in accordance with the major command's damage control plan. The size of these teams varies with the situation, and can be organized, using their organic squad as a nucleus. They are equipped with their squad tools plus air compressors, bulldozers, and a crane or heavy wrecker. By using the squad as the nucleus, the team can be increased to a platoon-, company-, battalion-, or larger-size rescue team if the situation dictates. These teams enter the disaster area and move heavy loads, clear routes of communication of rubble and debris, fight fires, and perform other work necessary to rescue personnel.

(2) Light rescue teams are organized by each company-size unit, except medical units and those units furnishing heavy rescue teams. These teams also use the squad as a nucleus for the team. They rescue personnel and equipment when such rescue does not require the use of heavy equipment.

(3) Labor teams are furnished by all company-size units and are based also on the units organic squad. They perform tasks which do not require special training or equipment.

(4) Decontamination teams are organized by each company sized unit. They perform all decontamination activities within the disaster area.

(5) Medical service teams are organized from the local medical installations, the number, type, and size determined by the surgeon. These teams provide emergency medical treatment and sorting stations established near the disaster area. The surgeon designates hospital facilities for those patients requiring hospitalization.

APPENDIX I

REFERENCES

1. Department of the Army Pamphlets

DA Pam 108–1	Index of Army Motion Pictures, Film Strips Slides, and Phono-Recordings.
DA Pam in the 310-series	Indexes Pertaining to Administration, Training, Maintenance, and Supply.
DA Pam 750–1	Preventative Maintenance Guide for Commanders.

2. Army Regulations

AR 55–650	Railroads.
AR 117–5	Military Mapping and Surveying.
AR 320–5	Dictionary of United States Army Terms.
AR 320–50	Authorized Abbreviations and Brevity Codes.
AR 700–38	Unsatisfactory Equipment Report.
AR 711–16	Stock Control—Installation Stock Control and Supply Procedures.
AR 735–35	Property Accountability—Supply Procedures for TOE Units, Organizations and Non-TOE Activities.
AR 750–8	Command Maintenance Inspections.

3. Field Manuals

FM 3–5	Tactics and Techniques of Chemical, Biological, and Radiological Warfare.
FM 5–15	Field Fortifications.
FM 5–20	Camouflage, Basic Principles and Field Camouflage.
FM 5–21	Camouflage of Fixed Installations.
FM 5–22	Camouflage Materials.
FM 5–23	Field Decoy Installations.
FM 5–25	Explosives and Demolitions.
FM 5–26	Employment of Atomic Demolition Munition (U).
FM 5 30	Engineer Intelligence.
FM 5–31	Use and Installation of Boobytraps.
FM 5–34	Engineer Field Data.

FM 5–35	Engineers' Reference and Logistical Data.
FM 5–36	Route Reconnaissance and Classification.
FM 5–132	Infantry Division Engineers.
FM 5–134	Armored Division Engineer Battalion.
FM 5–136	Airborne Division Engineer Battalion.
FM 5–142	Nondivisional Engineer Combat Units.
FM 5–162	Engineer Construction and Construction-Support Units.
FM 5–188	Engineer Topographic Units.
FM 6–25	Field Artillery Missile Group (REDSTONE) (U).
FM 7–10	Rifle Company, Infantry and Airborne Division Battle Groups.
FM 7–21	Headquarters and Headquarters Company, Infantry Division Battle Group.
FM 7–100	Infantry Division.
FM 17–50	Armor Logistics.
FM 17–100	The Armored Division and Combat Command.
FM 19–25	Military Police Traffic Control.
FM 20–32	Land Mine Warfare.
FM 21–5	Military Training.
FM 21–6	Techniques of Military Instruction.
FM 21–11	First Aid for Soldiers.
FM 21–30	Military Symbols.
FM 21–40	Small Unit Procedures in Atomic, Biological, and Chemical Warfare.
FM 22–100	Military Leadership.
FM 24–18	Field Radio Techniques.
FM 24–20	Field Wire Techniques.
FM 27–10	The Law of Land Warfare.
FM 30–5	Combat Intelligence.
FM 30–10	Terrain Intelligence.
FM 30–16	Technical Intelligence (U).
FM 31–10	Barrier and Denial Operations.
FM 31–15	Operations against Airborne Attack, Guerrilla Action and Infiltration.
FM 31–21	Guerrilla Warfare and Special Forces Operations.
FM 31–30	Jungle Operations.
FM 31–40	Tactical Cover and Deception (U).
FM 31–50	Combat in Fortified Areas and Towns.
FM 31–60	River Crossing Operations.
FM 31–70	Basic Cold Weather Manual.
FM 31–71	Northern Operations.

FM 31–72	Mountain Operations.
FM 41–5	Joint Manual of Civil Affairs/Military Government.
FM 54–1	The Logistical Command.
FM 55–51	Transportation Terminal Commands Theater of Operations.
FM 57–30	Airborne Operations.
FM 57–100	Airborne Division.
FM 100–1	Field Service Regulations; Doctrinal Guidance (U).
FM 100–5	Field Service Regulations; Operations.
FM 100–10	Field Service Regulations; Administration.
FM 101–5	Staff Officers Field Manual; Staff Organization and Procedure.
FM 101–10	Staff Officers Field Manual; Organization, Technical and Logistical Data.

4. Technical Manuals

TM 3–220	Decontamination.
TM 5–200	Camouflage Nets and Net Sets.
TM 5–220	Passage of Obstacles other than Minefields.
TM 5–223	Foreign Mine Warfare.
TM 5–231	Mapping Functions of the Corps of Engineers.
TM 5–240	A Guide to the Compilation and Revision of Maps.
TM 5–250	Roads and Airfields.
TM 5–251	Army Airfields and Heliports.
TM 5–260	Principles of Bridging.
TM 5–300	Real Estate Operations in Oversea Commands.
TM 5–301	Engineer Functional Components System Staff Tables of Installations, Facilities, and Equipages.
TM 5–302	Construction in Theater of Operations.
TM 5–303	Bill of Materials for Theater of Operations Construction.
TM 5–310	Military Protective Construction.
TM 5–350	Military Pipeline Systems.
TM 5–360	Port Construction and Rehabilitation.
TM 5–370	Railroad Construction.
TM 5–505	Maintenance of Engineer Equipment.
TM 5–545	Geology and its Military Applications.
TM 5–700	Field Water Supply.

TM 9–207	Operation and Maintenance of Ordnance Material in Extreme Cold Weather, 0° to —65°F.
TM 9–2810	Preventive Maintenance—Tactical Motor Vehicles.

APPENDIX II

EXTRACTS FROM TABLES OF ORGANIZATION AND EQUIPMENT

NUMERICAL LISTING

TOE	Unit	Page
5-5D	Armored Division Engineer Battalion	156
5-6D	Headquarters and Headquarters Company, Armored Division Engineer Battalion	159
5-7D	Engineer Company, Armored Division Engineer Battalion	162
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TOE 5–5D

ARMORED DIVISION ENGINEER BATTALION

Section A. GENERAL

1. **Mission.** *a.* To increase the combat effectiveness of the Armored Division by means of general engineer work.

b. To undertake and carry out armored infantry combat missions when required.

2. **Assignment.** Organic to the Armored Division, TOE–17.

3. **Capabilities.** Provides engineer support for the Armored Division as follows:

a. Provides engineer staff planning and supervision for organic and attached engineer troops.

b. Performs construction, repair and maintenance of roads, bridges, fords and culverts.

c. Provides support of hasty stream crossing operations with boats, rafts, and bridges; provides coordination of organic and attached engineer troops, in support of deliberate stream crossings.

d. Provides fixed bridging for passage of short gaps.

e. Assists in removal of obstacles, including mines and boobytraps.

f. Assists in the emplacement of obstacles, including mines and boobytraps.

g. Prepares and executes demolitions, including employment of ADM.

h. Assists other troops in preparation of fortifications and camouflage.

i. Performs engineer reconnaissance and intelligence.

j. Provides general construction, including construction of landing strips.

k. Performs construction and placement of deceptive devices.

l. Provides engineer Class II and IV supplies.

m. Provides organizational maintenance repair services for equipment organic to the battalion; engineer third echelon maintenance and engineer repair parts supply support for all engineer equipment organic to the Armored Division.

n. Provides water purification and supply.

o. Provides map supply.

p. Provides technical advice to supported units on engineering

matters, including recommendations for employment of engineer troops.

q. Provides assistance in assault of fortified positions.

r. Exploits locally available sources of materials for construction, fortifications, and camouflage.

4. Basis of Allocation. One per Armored Division, TOE 17.

5. Category. I.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 7)

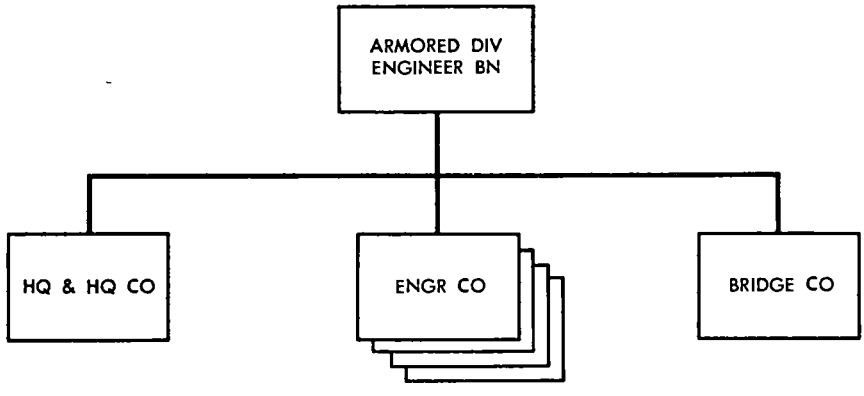


Figure 7. Organizational Chart of Armored Division Engineer Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons	*AGG*	*Breakdown Within Organic Units*			
		5-5D	*5-6D*	*5-7D*	*5-8D*
Gun machine 7.62 MM LW	42	4	9	2
Gun machine CAL .50 BRG HB	47	8	5	19
Launcher rocket 3.5-inch	47	5	9	6
Vehicles				
Carrier personnel full trkd	43	3	10	
Semitrailer low bed 25-T	7	3	1	
Tank combat full trkd w/dozer blade	12	--	3	
Tank recovery vehicle med	2	2		
Truck cargo 2½-T	36	13	3	11

Weapons	*AGG Breakdown Within Organic Units*			
	5–5D	*5–6D*	*5–7D*	*5–8D*
Truck dump 5-T	40	12	7	
Truck tank fuel servicing 2½-T	6	1	1	1
Truck tractor 5-T	9	5	1	
Truck utility ¼-T	38	13	4	9
Truck wrecker 5-T	6	1	1	1
Engineer Equipment				
Boat bridge erection inboard Eng alum 27 ft.	6	--	--	6
Boat landing inflat assault craft 15-man	18	--	--	18
Boat recon pneu 3-man	3	3		
Bridge armored vehicle launched scissoring TY CL 60 alum 60 ft length of span.	9	--	--	9
Bridge floating highway alum deck balk superstructure.	3	--	--	3
Bridge erect set floating bridge alum deck balk superstructure.	3	--	--	3
Crane shovel trk mtd 20-T ¾ cu yd	4	3	--	1
Grader road MTZD hvy	1	1		
Launcher M48 tank chassis transptg for 40 ft & 60 ft bridge armored vehicle launched scissoring TY CL 60.	6	--	--	6
Loader scoop type dsl 2½ cu yd	3	3		
Semitrailer rep parts shop van 6-T	1	1		
Shop equip organzl rep light trk mtd	1	1		
Shop equip contact maint trk mtd	2	2		
Shop equip elec rep semitrlr mtd	1	1		
Tractor full trkd low spd med w/angle blade	7	3	1	
Trailer basic utility 2½-T	18	--	3	6
Trailer flat bed 10-T	1	1		
Truck state 5-T bridge transptg	42	--	--	42
Water purification equip set trk mtd 1500 gph.	5	5		
Signal Equipment				
Detector set AN/PRS–3	45	3	9	6
Intercommunication station AN/VIA–4	6	--	--	6
Radio set AN/GRC–3	40	--	7	12
Radio set AN/GRC–19	13	8	1	1
Radio set AN/GRR–5	6	1	1	1
Radio set AN/PRC–6	9	--	--	9
Radio set AN/PRC–8	4	--	1	
Radio set AN/VRC–8	4	1	--	3
Radio set AN/VRC–16	1	--	--	1
Radio set AN/VRQ–1	1	1		
Radio set AN/VRC–20	7	3	1	
Radio set AN/VRC–29	1	1		
Radio set AN/VRC–34	3	3		
Radio teletypewriter set AN/GRC–46	2	2		
Switchboard telephone SB–993/GT	7	1	1	2
Switchboard telephone SB–22/PT	1	1		

TOE 5–6D

HEADQUARTERS AND HEADQUARTERS COMPANY ARMORED DIVISION ENGINEER BATTALION

Section A. GENERAL

1. Mission. *a.* Headquarters. To provide an engineer special staff section for the division, and to provide command and staff for the Armored Division Engineer Battalion.

b. Headquarters Company.

(1) To provide administration, communication, reconnaissance, maintenance support, supply, medical service and supplemental heavy equipment for the Armored Division Engineer Battalion.

(2) To provide engineer supply and engineer maintenance support for the Armored Division.

2. Assignment. Organic to Armored Division Engineer Battalion, TOE 5–5D.

3. Capabilities. This unit provides:

a. Staff planning and supervision of division engineer operations, including attached engineer troops.

b. Engineer Class II and IV supply, water purification and supply with 5 water supply points, and map supply to the Armored Division.

c. Engineer reconnaissance, intelligence and operation of battalion communication system.

d. Organizational maintenance and repair service for equipment organic to the battalion; engineer third echelon maintenance and engineer repair parts supply support for all engineer equipment organic to the Armored Division.

e. Preparation and execution of demolition including employment of ADM.

f. Additional support for the Armored Division Engineer Battalion, including administration, medical services and furnishing supplemental engineer equipment.

4. Basis of Allocation. One per Armored Division Engineer Battalion, TOE 5–5D.

5. Category. I.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 8)

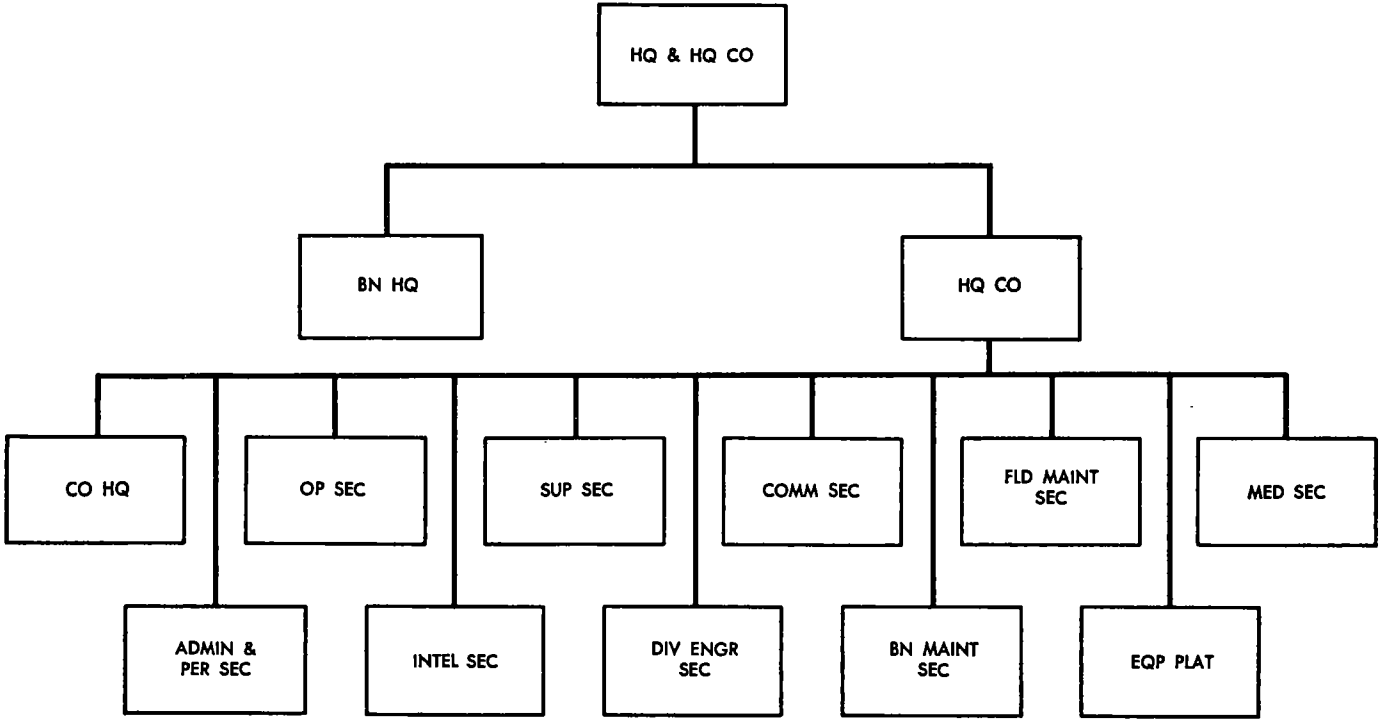


Figure 8. Organizational Chart Headquarters and Headquarters Company Armored Division Engineer Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–5D.)

TOE 5–7D

ENGINEER COMPANY, ARMORED DIVISION ENGINEER BATTALION

Section A. GENERAL

1. Mission. *a.* To provide an operating component of the Armmored Division Engineer Battalion to perform general engineer work facilitating and contributing to the combat effectiveness of the Armored Division.

b. To undertake and carry out armored Infantry combat missions when required.

2. Assignment. Organic to Armored Division Engineer Battalion, TOE 5–5D.

3. Capabilities. This unit performs the following combat engineer tasks:

a. Repair and maintenance of roads, bridges, fords, culverts, and when augmented with additional engineer heavy equipment can execute more complex construction tasks including roads and air landing facilities.

b. Assistance in emplacement and removal of obstacles, including mines and boobytraps.

c. Preparation and execution of demolitions.

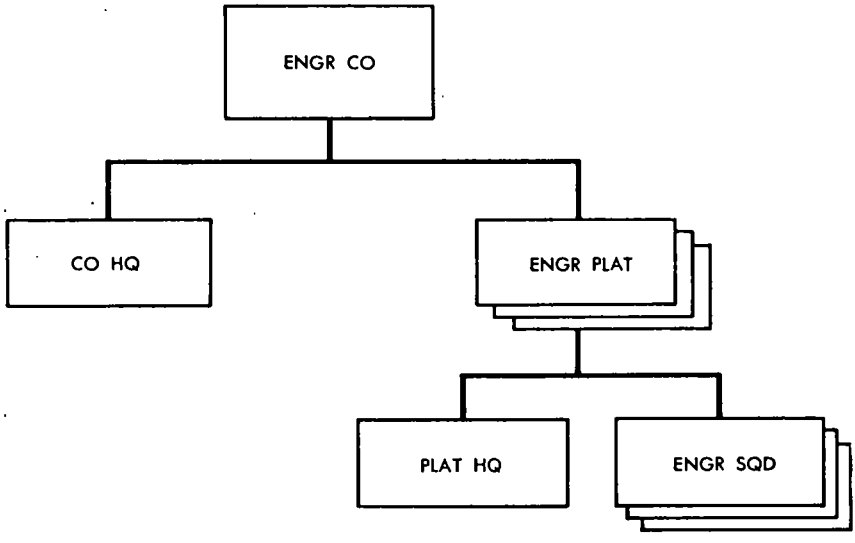
d. Assistance in preparation of fortifications, camouflage and deceptive device construction and emplacement, and assault of fortified positions.

4. Basis of Allocation. Four per Armored Division Engineer Battalion, TOE 5–5D.

5. Category. I.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 9)



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TOE 5-7D

Figure 9. Organizational Chart Engineer Company, Armored Division Engineer Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–5D.)

TOE 5–8D

BRIDGE COMPANY, ARMORED DIVISION ENGINEER BATTALION

Section A. GENERAL

1. **Mission.** *a.* To maintain and transport bridging and assault boat equipment organic to Armored Division Engineer Battalion and provide technical supervisory skills for bridge emplacement.

b. To undertake and carry out armored infantry combat missions when required.

2. **Assignment.** Organic to Armored Division Engineer Battalion, TOE 5–5D.

3. **Capabilities.** *a.* Maintains and transports three units of floating bridges which provide approximately 425 feet of 50-ton floating bridge or six 50-ton rafts. Bridge components may also be used to construct short fixed spans.

b. Provides assault vehicle launching bridge capability for three separate assault crossings and assault boats for transporting approximately 216 combat troops in one crossing.

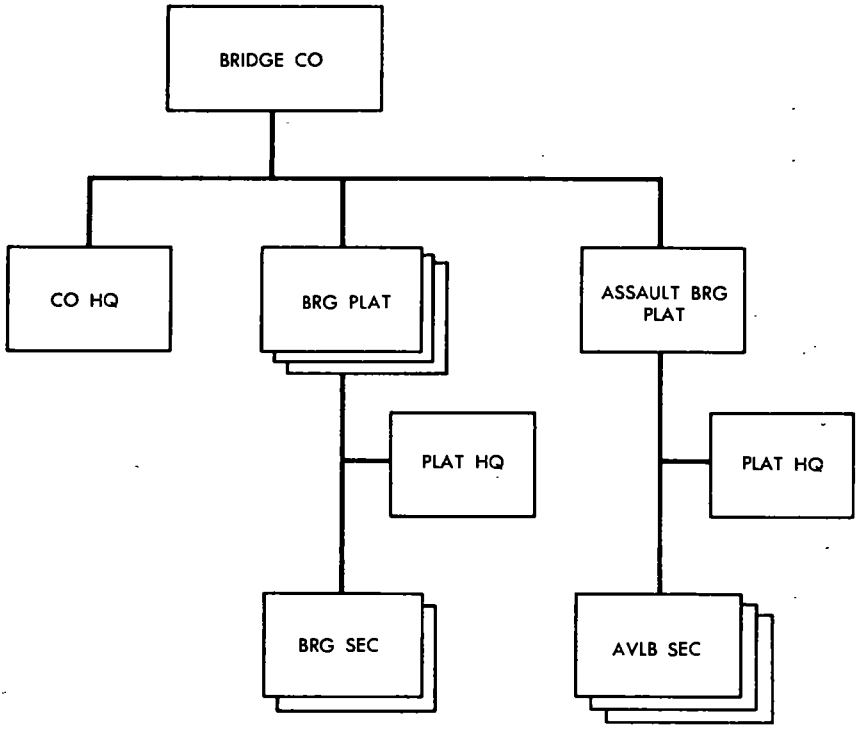
c. Provides technical supervision for bridge construction and in an emergency, constructs bridges with organic personnel.

4. **Basis of Allocation.** One per Armored Division Engineer Battalion, TOE 5–5D.

5. **Category.** I.

6. **Mobility.** One hundred percent.

Section B. ORGANIZATION (fig. 10)



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TOE 5-8D

Figure 10. Organizational Chart, Bridge Company, Armored Division Engineer Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–5D.)

TOE 5–15D

INFANTRY DIVISION ENGINEER BATTALION

Section A. GENERAL

1. Mission. *a.* To increase the combat effectiveness of the Infantry Division by means of general engineer work.

b. To undertake and carry out infantry combat missions when required.

2. Assignment. Organic to Infantry Division, TOE 7.

3. Capabilities. This unit provides engineer support for the Infantry Division by—

a. Providing engineer staff planning and supervision for organic and attached engineer troops.

b. Performing construction, repair and maintenance of roads, bridges, fords, and culverts.

c. Providing support of hasty stream crossing operations of opportunity with boats and rafts; coordination of organic and attached engineer troops for deliberate river crossings.

d. Providing fixed bridging for passage of short gaps.

e. Assisting in the removal of obstacles, including mines and boobytraps.

f. Assisting in the emplacement of obstacles, including mines and boobytraps.

g. Preparing and executing demolitions, including employment of ADM.

h. Assisting other troops in preparation of fortifications and camouflage.

i. Performing engineer reconnaissance and intelligence.

j. Providing general construction, including construction of landing strips.

k. Performing construction and placement of deceptive devices.

l. Providing engineer Class II and Class IV supplies.

m. Providing engineer field maintenance support.

n. Providing water purification and supply.

o. Providing map supply.

p. Providing technical advice to supported units on engineering matters, including recommendations for employment of engineer troops.

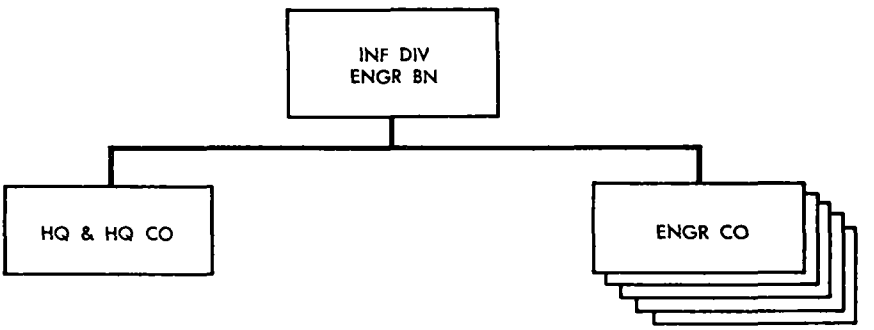
q. Providing assistance in assault of fortified positions.

4. Basis of Allocation. One per Infantry Division, TOE 7.

5. Category. I.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 11)



STRENGTH OFF 41 WO 4 EM 740 AGG 785
TOE 5-15D

Figure 11. Organizational Chart Infantry Division Engineer Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons	*AGG Breakdown Within Organic Units*		
	5-15D	*5-16D*	*5-17D*
Gun machine cal. .50 BRG HB	25	10	3
Gun machine 7.62 mm LW	32	2	6
Launcher rocket 3.5-inch	39	9	6
Vehicles			
Tank combat full trkd med gun	3	3	
Truck cargo ¾-T	10	5	1
Truck cargo 2½-T	23	8	3
Truck dump 5-T	49	9	8
Truck tank gasoline 2½-T	1	1	
Truck tractor 2½-T	2	2	
Truck tractor 5-T	14	4	2
Truck utility ¼-T	28	13	3
Truck wrecker med 5-T	1	1	
Welding shop trlr mtd	2	2	
Engineer Equipment			
Boat landing inflat assault craft 15-man	18	18	
Boat recon pneu 3-man	18	3	3
Bridge armored vehicle launched scissoring TY CL 60 alum 60 ft length of span.	6	6	

Engineer Equipment AGG Breakdown Within Organic Units

	5–15D	5–16D	5–17D
Bridge floating raft section light tactical	2	2	
Crane shovel trk mtd 20–T ¾ cu yd.	4	4	
Grader road MTZD dsl hvy	4	4	
Launcher M48 tank chassis transptg for 40 ft and 60 ft bridge armored vehicle launched scissoring TY CL 60.	3	3	
Loader scoop type dsl 2½ cu yd	3	3	
Lubricator & service unit trlr mtd 12 CFM air compressor.	1	1	
Pneu tool & compressor outfit 210 CFM trlr mtd	11	1	2
Semitrailer rep parts shop van 6-T	1	1	
Shop equip organzl rep light trk mtd	1	1	
Shop equip contact maint trk mtd	2	2	
Shop equip elect rep semitrlr mtd	1	1	
Tractor full tracked low spd sdl med	14	4	2
Trailer flat bed 10-T	3	3	
Truck stake 5-T bridge transptg	9	9	
Water purification equip set trk mtd 1500 GPH	5	5	
Signal Items			
Detector set AN/PRS–3	36	6	6
Intercommunication station AN/VIA–4	3	3	
Radio set AN/GRC–7	6	6	
Radio set AN/GRC–19	11	6	1
Radio set AN/GRR–5	6	1	1
Radio set AN/PRC–10	30	--	6
Radio set AN/VRC–10	18	3	3
Radio set AN/VRC–18	6	1	1
Radio set AN/VRC–34	8	3	1
Radio set Control group OA–1754/GRC	1	1	
Radio teletypewriter set AN/GRC–46	1	1	
Switchboard telephone SB–993/GT	6	1	1
Switchboard telephone SB–22/PT	2	2	

TOE 5–16D

HEADQUARTERS AND HEADQUARTERS COMPANY INFANTRY DIVISION ENGINEER BATTALION

Section A. GENERAL

1. **Mission.** *a.* To provide an engineer special staff section for the division, and command and staff, administration, communications, reconnaissance, medical services, supply, and supplemental heavy equipment for the Infantry Division Engineer Battalion.

b. To undertake and carry out infantry combat missions of a headquarters and headquarters company, when required.

2. **Assignment.** Organic to Infantry Division Engineer Battalion, TOE 5–15D.

3. **Capabilities.** This unit provides—

a. Staff planning and supervision of division engineer operations, including attached engineer troops.

b. Engineer services including water supply, and supplemental heavy equipment, including earth moving equipment, short gap fixed bridging and light stream crossing equipage.

c. Operation of the engineer battalion reconnaissance and communication systems.

d. Organizational maintenance repair service for equipment organic to the battalion; engineer third echelon maintenance and engineer repair parts supply support for all engineer equipment organic to the infantry Division.

e. Preparation and execution of demolitions including employment of ADM.

4. **Basis of Allocation.** One per Infantry Division Engineer Battalion, TOE 5–15D.

5. **Category.** I.

6. **Mobility.** One hundred percent.

Section B. ORGANIZATION (fig. 12)

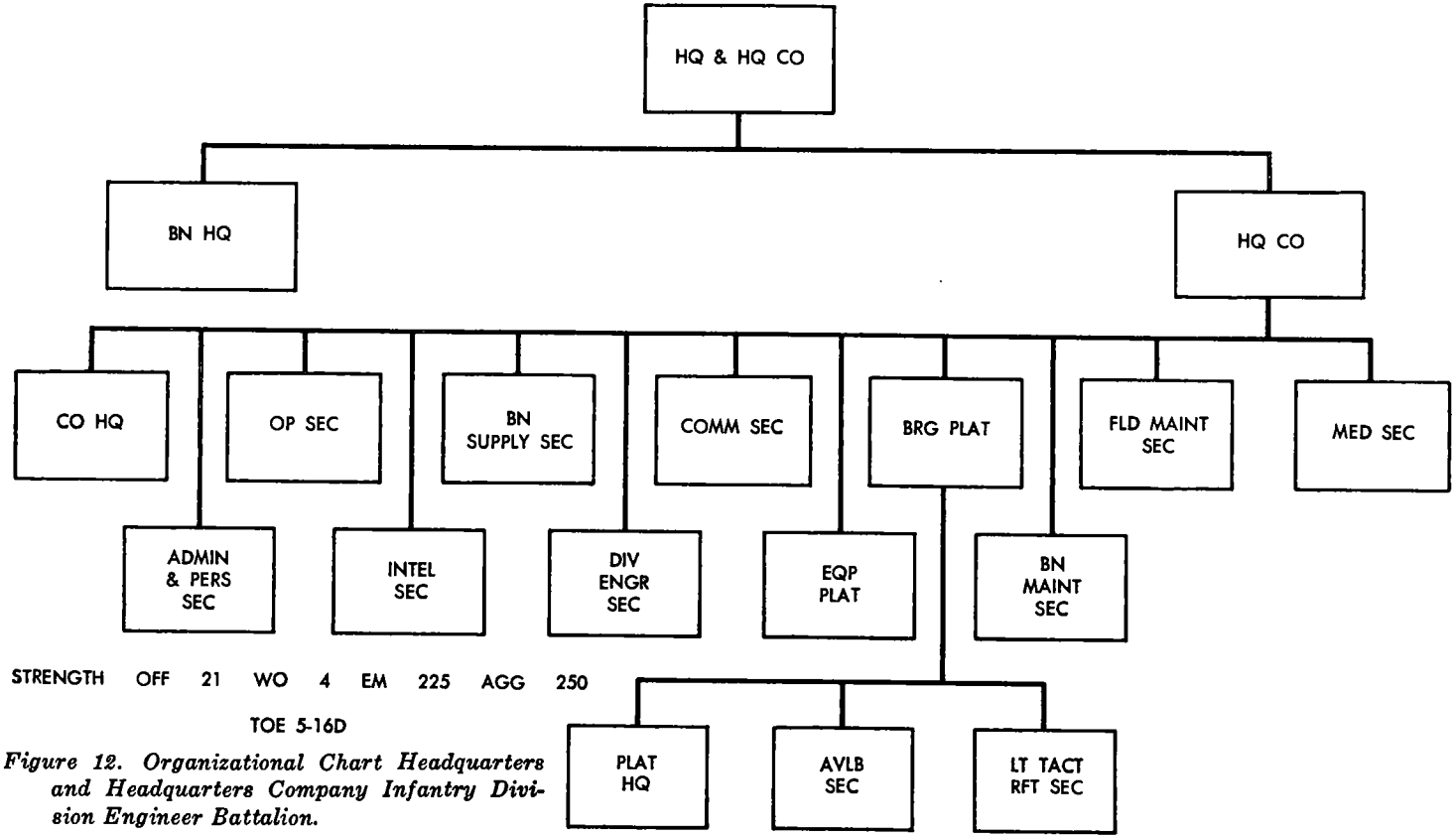


Figure 12. Organizational Chart Headquarters and Headquarters Company Infantry Division Engineer Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–15D.)

TOE 5–17D

ENGINEER COMPANY, INFANTRY DIVISION ENGINEER BATTALION

Section A. GENERAL

1. **Mission.** *a.* To provide an operating component of the Infantry Division Engineer Battalion.

b. To undertake and carry out infantry combat missions when required.

2. **Assignment.** Organic to Infantry Division Engineer Battalion, TOE 5–15D.

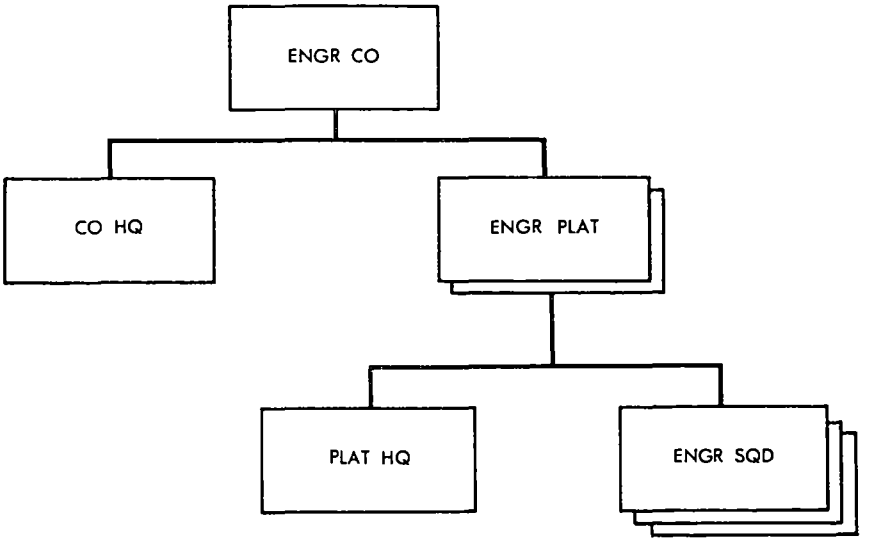
3. **Capabilities.** This unit performs combat engineer tasks and when reinforced with additional heavy equipment can execute more complex engineering works. It provides engineer support for a committed battle group.

4. **Basis of Allocation.** Five per Infantry Division Engineer Battalion, TOE 5–15D.

5. **Category.** I.

6. **Mobility.** One hundred percent.

Section B. ORGANIZATION (fig. 13)



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TOE 5-17D

Figure 13. Organizational Chart Engineer Company, Infantry Division Engineer Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C of TOE 5–15D.)

TOE 5–35D

ENGINEER COMBAT BATTALION, ARMY

Section A. GENERAL

1. Mission. *a.* To increase combat effectiveness of the field army by means of general engineer work and to reinforce divisional engineers when required.

b. To perform infantry combat mission when required.

2. Assignment. To corps or army with normal attachment to engineer combat group.

3. Capabilities. The battalion is capable of providing engineer support as follows:

a. Staff planning and supervision of battalion operations.

b. Engineer reconnaissance and intelligence.

c. Construction, repair, and maintenance of roads, fords, culverts, fixed or floating bridges, landing strips, command posts, supply installations, shelters, and defensive installations.

d. Preparation and removal of obstacles, including minefields.

e. Preparation and execution of demolitions, including ADM.

f. Installation and operation of field water supply facilities.

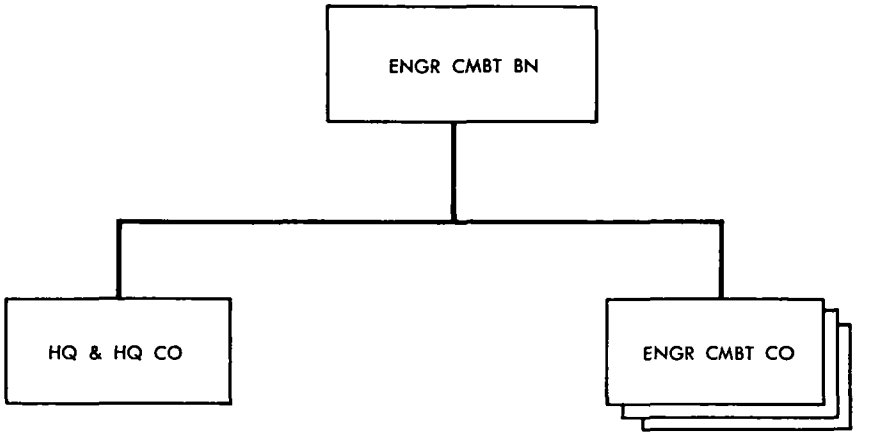
g. Construction and placement of deceptive devices.

4. Basis of Allocation. Normally twenty-seven battalions per field army.

5. Category. I.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 14)



STRENGTH OFF 30 WO 3 EM 586 AGG 619

TOE 5-35D

Figure 14. Organizational Chart Engineer Combat Battalion, Army.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons	*AGG Breakdown of Organic Units*		
	5-35D	*5-36D*	*5-37D*
Gun machine cal. .50 BRG HB	18	6	4
Gun machine 7.62 mm LW	20	2	6
Launcher rocket 3.5-inch	34	7	9
Vehicles			
Semitrailer low bed 25-T	7	1	2
Truck cargo ¾-T	21	6	5
Truck cargo 2½-T	15	9	2
Truck dump 5-T	39	3	12
Truck tractor 5-T	7	1	2
Truck utility ¼-T	30	15	5
Truck wrecker 5-T	1	1	
Engineer Items			
Boat recon pneu 3-man	6	6	
Crane shovel trk mtd 20 T ¾ cu yd	2	2	
Grader road MTZD dsl	3	3	
Loader scoop 4 whl 2½ cu yd	3	3	
Pneu tool & compressor outfit 210 CFM	4	1	1
Shop equip organzl repair light trk mtd	1	1	
Tractor full tracked med w/angle blade	7	1	2
Trailer utility 2½-T	36	--	12
Trailer flat bed 10-T	2	2	

	AGG Breakdown of Organic Units		
	5-35D	5-36D	5-37D
Water purification equip set trk mtd 1500 GPH	4	4	
Welding shop trlr mtd	1	1	
Signal Items			
Detector set AN/PRS-3	39	12	9
Radio set AN/PRC-10	27	--	9
Radio set AN/VRC-34	9	6	1
Radio set AN/GRC-19	5	2	1
Radio set AN/GRR-5	1	1	
Radio set AN/VRC-10	13	1	4
Radio set AN/VRC-18	4	1	1
Teletypewriter set AN/PGC-1	1	1	

TOE 5–36D

HEADQUARTERS, AND HEADQUARTERS COMPANY ENGINEER COMBAT BATTALION, ARMY

Section A. GENERAL

1. **Mission.** *a.* To provide command and staff, administration, communications, reconnaissance, supply, supplemental heavy equipment, and medical service for the Engineer Combat Battalion, Army.

b. To perform infantry combat missions when required.

2. **Assignment.** Organic to Engineer Combat Battalion, Army, TOE, 5–35D.

3. **Capabilities.** This unit is capable of providing—

a. Staff planning and supervision of battalion operations.

b. Engineer supply and service including four water points.

c. Supplemental engineer equipment and organizational maintenance support to combat companies.

d. Engineer reconnaissance.

e. Operation of battalion communication systems.

f. Organizational maintenance of organic equipment.

g. Medical service for battalion and attached units to include emergency medical treatment, operation of a battalion aid station, evacuation of casualties if practicable, and supervision of sanitation.

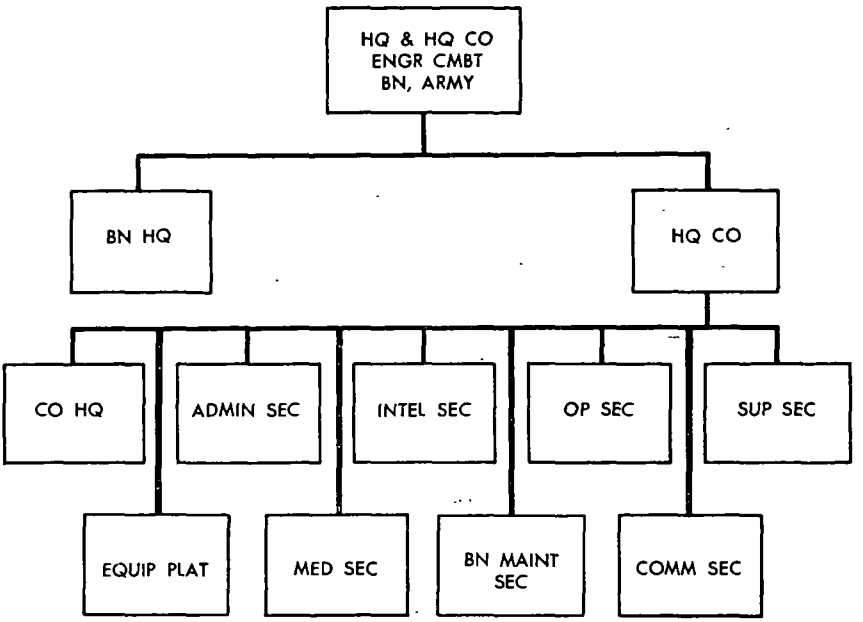
h. Preparation and execution of demolitions including employment of ADM.

4. **Basis of Allocation.** One per Engineer Combat Battalion, Army, TOE 5–35D.

5. **Category.** I.

6. **Mobility.** One hundred percent.

Section B. ORGANIZATION (fig. 15)



STRENGTH OFF 15 WO 3 EM 139 AGG 157

TOE 5-36D

Figure 15. Organizational Chart Headquarters and Headquarters Company Engineer Combat Battalion, Army.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C of TOE 5–35D.)

TOE 5–37D

ENGINEER COMBAT COMPANY, ENGINEER COMBAT BATTALON, ARMY

Section A. GENERAL

1. **Mission.** *a.* To provide an operating component of the Engineer Combat Battalion, Army for performance of general engineer work contributing to the combat effectiveness of the army in the field.

b. To perform infantry combat missions as required.

2. **Assignment.** Organic to the Engineer Combat Battalion, Army, TOE 5–35D.

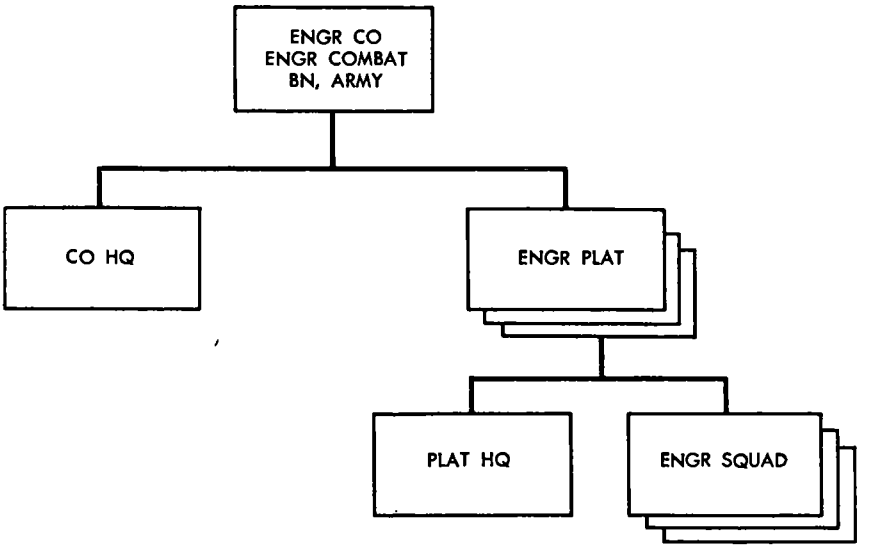
3. **Capabilities.** This unit performs combat engineer missions to include heavy engineer tasks when reinforced with additional heavy equipment and operator personnel.

4. **Basis of Allocation.** Three companies per Engineer Combat Battalion, Army TOE 5–35D.

5. **Category.** I.

6. **Mobility.** One hundred percent.

Section B. ORGANIZATION (fig. 16)



STRENGTH OFF 5 WO 0 EM 149 AGG 154

TOE 5-37D

Figure 16. Organizational Chart Engineer Combat Company, Engineer Combat Battalion, Army.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C of TOE 5–35D.)

TOE 5–48D

ENGINEER SUPPLY POINT COMPANY

Section A. GENERAL

1. Mission. To operate engineer supply points in the corps and army areas.

2. Assignment. Normally assigned to army or independent corps.

3. Capabilities. This unit is capable of—

a. Receiving, storing, and issuing engineer supplies (normally class IV).

b. Maintaining records of items within its jurisdiction.

c. Supervising military or civilian labor in supply point operations.

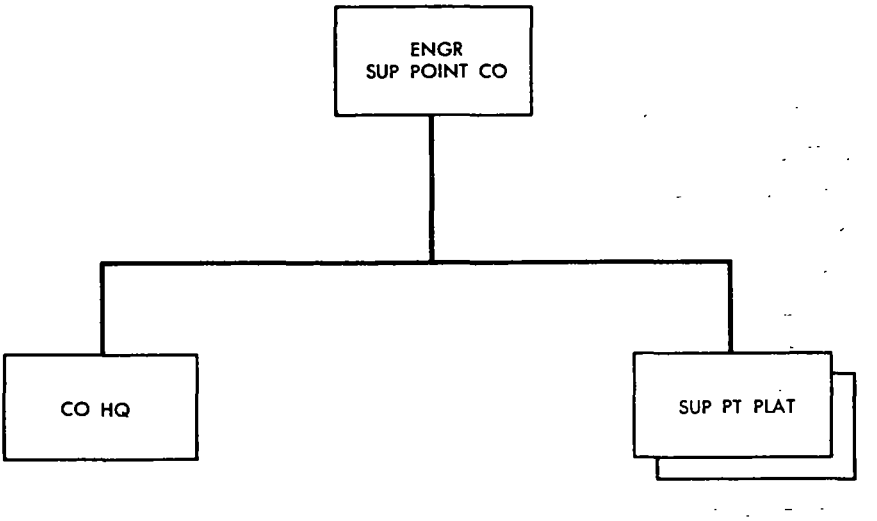
d. Providing internal security for supply points.

4. Basis of Allocation. Three per Army.

5. Category. II.

6. Mobility. Fifty percent.

Section B. ORGANIZATION (fig. 17)



STRENGTH OFF 3 WO 1 EM 98 AGG 102
TOE 5-48D

Figure 17. Organizational Chart Engineer Supply Point Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Semitrailer low bed 25-T	3
Truck cargo 2½-ton	2
Truck cargo ¾-T	1
Truck dump 5-ton	4
Truck tractor 5-ton	3

Engineer Equipment

Crane tractor mtd 35 ft boom for tractor full trckd low spd	1
Crane-shovel trk mtd 20–24 ¾-ton, ¾ cu yd	2
Tractor full trckd med w/dozer blade	1

HEADQUARTERS AND HEADQUARTERS COMPANY ENGINEER COMBAT GROUP

Section A. GENERAL

1. **Mission.** *a.* To command and supervise assigned or attached units.

b. To plan and coordinate the operations of a group comprising engineer combat battalions and other assigned or attached units engaged in engineer combat support activities.

2. **Assignment.** To army or corps.

3. **Capabilities.** *a.* Providing staff planning and supervision of operations of assigned or attached units.

b. Conducting engineer reconnaissance by air and ground means.

c. Providing fixed and rotary wing aircraft for support of the reconnaissance, construction activities, and employment of ADM, of subordinate units.

d. Supervising and assisting in administrative and supply matters of assigned and attached units.

e. Operating the group communications system.

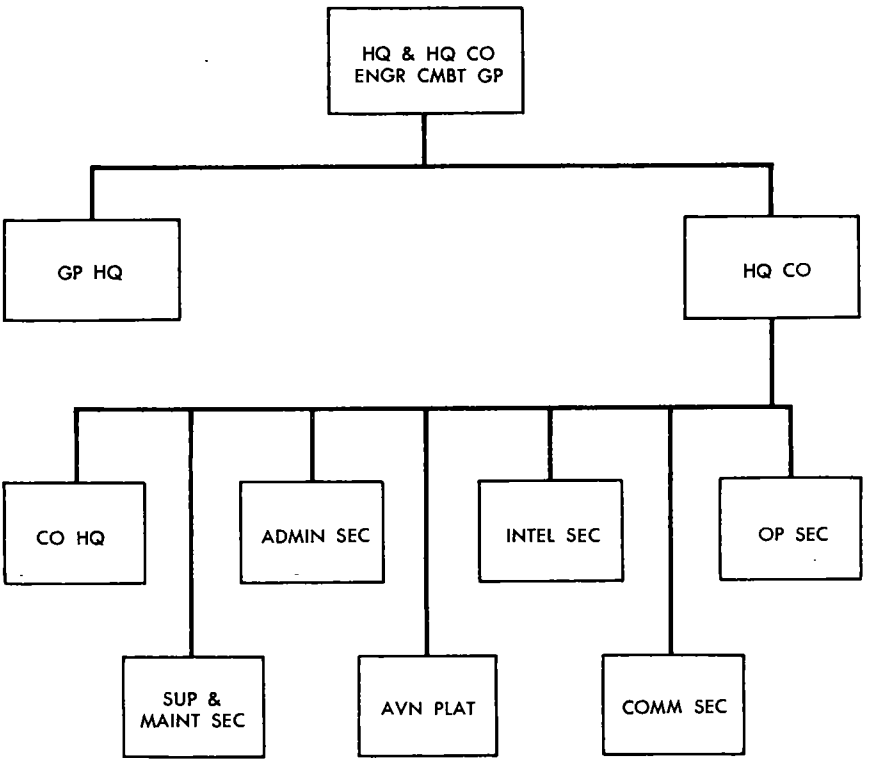
f. Supervising medical service and sanitation within the group.

4. **Basis of Allocation.** One to three (3) to six (6) Engineer combat battalions, Army, TOE 5–35D.

5. **Category.** II.

6. **Mobility.** One hundred percent.

Section B. ORGANIZATION (fig.18)



STRENGTH OFF 19 WO 6 EM 86 AGG 111

TOE 5-52D

Figure 18. Organizational Chart Headquarters and Headquarters Company, Engineer Combat Group.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons

Gun machine 7.62 mm LW	1
Launcher rocket 3.5-inch	4

Vehicles

Truck cargo, 2½-T	7
Truck fuel, 2½-T	1
Truck cargo, ¾-T	5

Signal

Radio set AN/GRC–19	3
Radio set AN/GRR–5	2

Radio set AN/VRC–10	1
Radio set AN/VRC–18	1
Radio set AN/VRC–34	4
Radio receiver R–392/URR	1
Radio set AN/URC–4	12
Teletypewriter AN/PGC–1	1

Aircraft

Airplane observation light	5
Airplane utility	1
Helicopter observation	4
Helicopter utility	2

TOE 5–54D

ENGINEER LIGHT EQUIPMENT COMPANY
OR
ENGINEER LIGHT EQUIPMENT COMPANY, AIRBORNE

Section A. GENERAL

1. Mission. *a.* (1) Engineer Light Equipment Company. To operate and maintain a concentration of construction equipment in support of engineer combat units.

(2) Engineer Light Equipment Company, Airborne. To operate and maintain a concentration of construction equipment which will provide an engineer capability for construction of airstrips in airheads, and subsequently for support of engineer units within the airhead.

b. To fight as infantry when required.

2. Assignment. *a.* Engineer Light Equipment Company. To Army with normal attachment to Engineer Combat Group, TOE 5–52D.

b. Engineer Light Equipment Company, Airborne. To army with normal assignment to Airborne Corps.

3. Capabilities. *a.* When organized as Engineer Light Equipment Company this unit is capable of—

(1) Operating in support of three engineer combat battalions, army, engaged in general engineer work.

(2) Providing additional equipment support, when required, for divisional engineers.

(3) Providing two-shift operation of construction equipment.

(4) Providing organizational maintenance of organic equipment.

When organized as an Airborne Company this unit is capable of—

b. (1) Being delivered by parachute and/or assault aircraft in airhead operations.

(2) Providing the basic construction unit for airstrip construction.

(3) Providing additional equipment support for army engineers when relieved of airstrip construction.

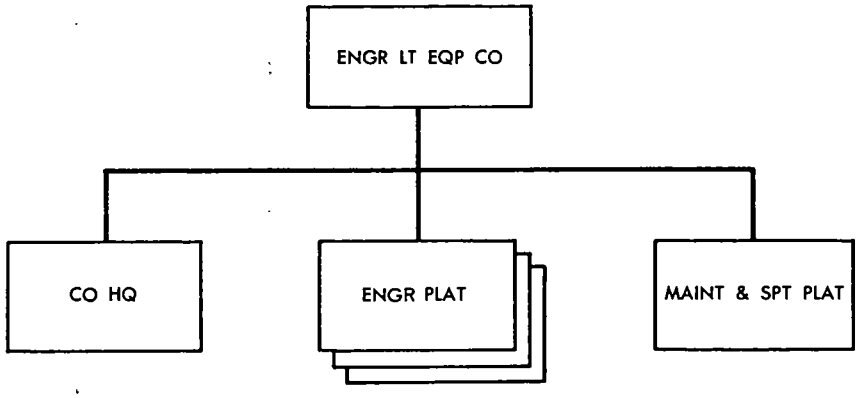
4. Basis of Allocation. *a.* Engineer Light Equipment Company. One per three engineer combat battalions, army.

b. Engineer Light Equipment Company, Airborne. One per Airborne Corps.

5. Category. II.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 19)



STRENGTH

ENGINEER LIGHT EQUIPMENT COMPANY

OFF 5 WO 1 EM 180 AGG 186

ENGINEER LIGHT EQUIPMENT COMPANY, AIRBORNE

OFF 6 WO 1 EM 170 AGG 177

TOE 5-54D

Figure 19. Organizational Chart Engineer Light Equipment Company or Engineer Light Equipment Company, Airborne.

Section C. MAJOR ITEMS OF EQUIPMENT

	Engineer Lt Equip Company	*Engineer Lt Equip Company Airborne*
Weapons		
Gun machine 7.62 mm lw	6	6
Launcher rocket 3.5 inch gun	6	6
Vehicles		
Truck cargo 2½-T	4	2
Truck cargo ¾-T	5	4
Truck dump 2½-T	--	15
Truck dump 5-T	14	12
Truck tank fuel 2½-T	2	2
Truck tractor 5-T	15	
Truck wrecker 5-T	1	1
Truck tractor 10-T	5	
Welding shop trlr mtd	1	1

	Engineer Lt Equip Company	*Engineer Lt Equip Company Airborne*
Engineer Items		
Compressor, rotary	2	
Crane shovel 7-T ¾ cu yd	--	2
Crane shovel 10-T ¾ cu yd	2	
Crane shovel 20-T ¾ cu yd	4	
Crush and screen pl 25 cu yd per hour	1	
Distributor bitumin material	1	
Distributor water tank	1	
Grader road mtzd	9	
Grader road mtzd air transp	--	9
Intrenching machine combat	3	
Kettle heating, bitumin trlr mtd 165 gal	2	
Loader scoop type 2½ cu yd	4	4
Loader scoop type 1½ cu yd	--	6
Lubricator and serv unit trlr mtd	1	1
Mixer concrete trlr mtd 16 cu ft	1	
Pneu tool and compressor outfit trlr mtd	3	5
Rock drilling equip mtzd	1	
Roller/10-T	1	
Roller towed sheepsfoot	3	3
Roller towed pneu tired 7½-35-T	--	2
Roller towed pneu tired 13 whl	1	
Rooter road 24-in depth towed	3	
Scraper earth moving/7½ cu yd	--	9
Scraper earthmoving 12 cu yd	9	
Semitrailer repair parts shop van 6-T	1	
Shop equip organizl rep light trk mtd	1	1
Shop equip contact maint trk/mtd	2	2
Tractor full trkd air transp	--	12
Tractor full trkd med w/dozer	7	
Tractor full trkd hvy w/dozer	3	
Tractor whl dsl w/dozer	3	
Trailer flat bed 10-T	5	1
Trailer low bed 8-T	--	12
Signal		
Radio set AN/GRC–19	1	
Radio set AN/GRR–5	1	
Radio set AN/VRC–34	5	
Radio set AN/VRQ–3	--	1
Radio set AN/VRC–10	--	4

TOE 5–55D
ENGINEER TOPOGRAPHIC BATTALION, ARMY

Section A. GENERAL

1. Mission. To provide maps and engineer survey information as required for an Army in the field.

2. Assignment. To field army.

3. Capabilities. This unit is capable of—

a. Preparing maps, photomaps, sketches, drawings, and related material.

b. Reproducing new and existing maps and other intelligence material.

c. Storing and distributing maps and similar material required by army troops and corps.

d. Performing topographic surveys and providing survey information required by an army in the field.

e. Preparing engineer intelligence reports as directed.

f. Individuals of this unit can fight as infantrymen when required.

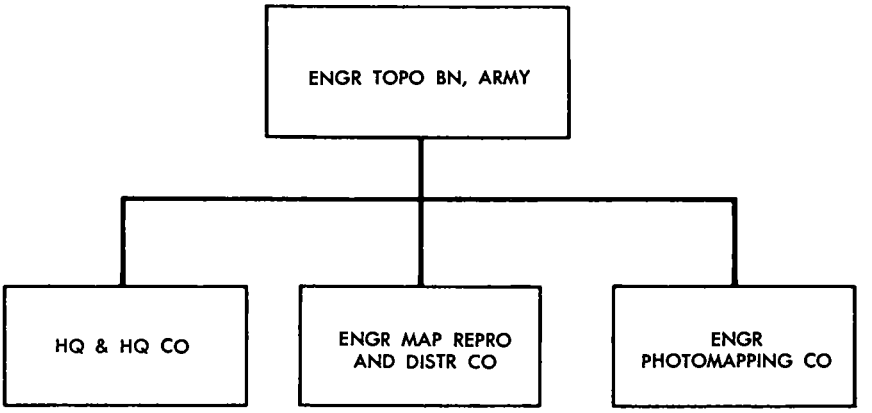
The unit has the capability of defending itself and its installation against hostile ground attack.

4. Basis of Allocation. One per field army.

5. Category. II.

6. Mobility. Seventy-five percent.

Section B. ORGANIZATION (fig. 20)



STRENGTH OFF 18 WO 8 EM 323 AGG 349
TOE 5-55D

Figure 20. Organizational Chart Engineer Topographic Battalion, Army.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons

	AGG Breakdown Within Organic Units			
	5–55D	*5–56D*	*5–57D*	*5–59D*
Gun machine cal. 50 hb	5	2	2	1
Launcher rocket 3.5-inch	4	--	2	2
Vehicles				
Truck cargo ¾-T	17	12	7	1
Truck cargo 2½-T	19	8	9	2
Truck van shop 2½-T	6	--	--	6
Truck wrecker 5-T	1	1		
Engineer Equipment				
Beacon surveying target	8	8		
Camera sect topo reprod set trk mtd	1	--	1	
Computing and drafting equip set 1	1	1		
Interpretation kit photogrammetric	3	3		
Lab sect topo reprod set trk mtd	1	--	1	
Map distribution set 2	1	--	1	
Map layout sect topo reprod set trk mtd	1	--	1	
Photogrammetric equip set 1	1	--	1	
Photo print and process sect topo reprod set trk mtd.	1	--	1	
Plate grainer sect topo reprod set trk mtd	1	--	1	
Plate process sect topo reprod set trk mtd	1	--	1	
Press sect topo reprod set trk mtd	4	--	4	
Rep set surveying instrument set 1	1	1		
Rod level geodetic	1	1		

	AGG Breakdown Within Organic Units			
	5-55D	5-56D	5-57D	5-59D
Sterometer set 1	6	--	--	6
Steroscope prism-mirror	4	2	--	2
Survey set astron azi for alt and long observ	1	--	1	
Surveying set plane table	4	4		
Surveying set precise traversing set 11	4	4		
Surveying set triangulation recon set 12	1	1		
Surveying set triangulation set 16	1	1		
Tower erection set topo	1	1		
Water quality control set	1	--	1	
Water purification set trlr mtd 60 gph	1	--	1	
Signal Items				
Detector set AN/PRS-3	2	2		
Receiving set radio AN/TRR-8	1	1		

TOE 5–56D

HEADQUARTERS AND HEADQUARTERS COMPANY, ENGINEER TOPOGRAPHIC BATTALION, ARMY

Section A. GENERAL

1. Mission. To provide command and staff, supply, and maintenance for the Engineer Topographic Battalion, Army, and to furnish engineer survey information required by an army in the field.

2. Assignment. Organic to Engineer Topographic Battalion, Army, TOE 5–55D.

3. Capabilities. This unit is capable of:

a. Supervising administration, training, and operation of the units organic to the army topographic battalion.

b. Providing supply and maintenance required in support of army topographic battalion.

c. Preparing engineer intelligence reports as directed; operating survey information center to collect, coordinate, and disseminate survey information for use of army units.

d. Performing surveys required for topographic mapping, carrying ground control forward to corps survey elements; providing supplementary survey personnel for engineer combat units.

e. Individuals of this unit can fight as infantrymen when required. The unit has the capability of defending itself and its installations against hostile ground attack.

4. Basis of Allocation. One per Engineer Topographic Battalion, Army, TOE 5–55D.

5. Category. II.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 21)

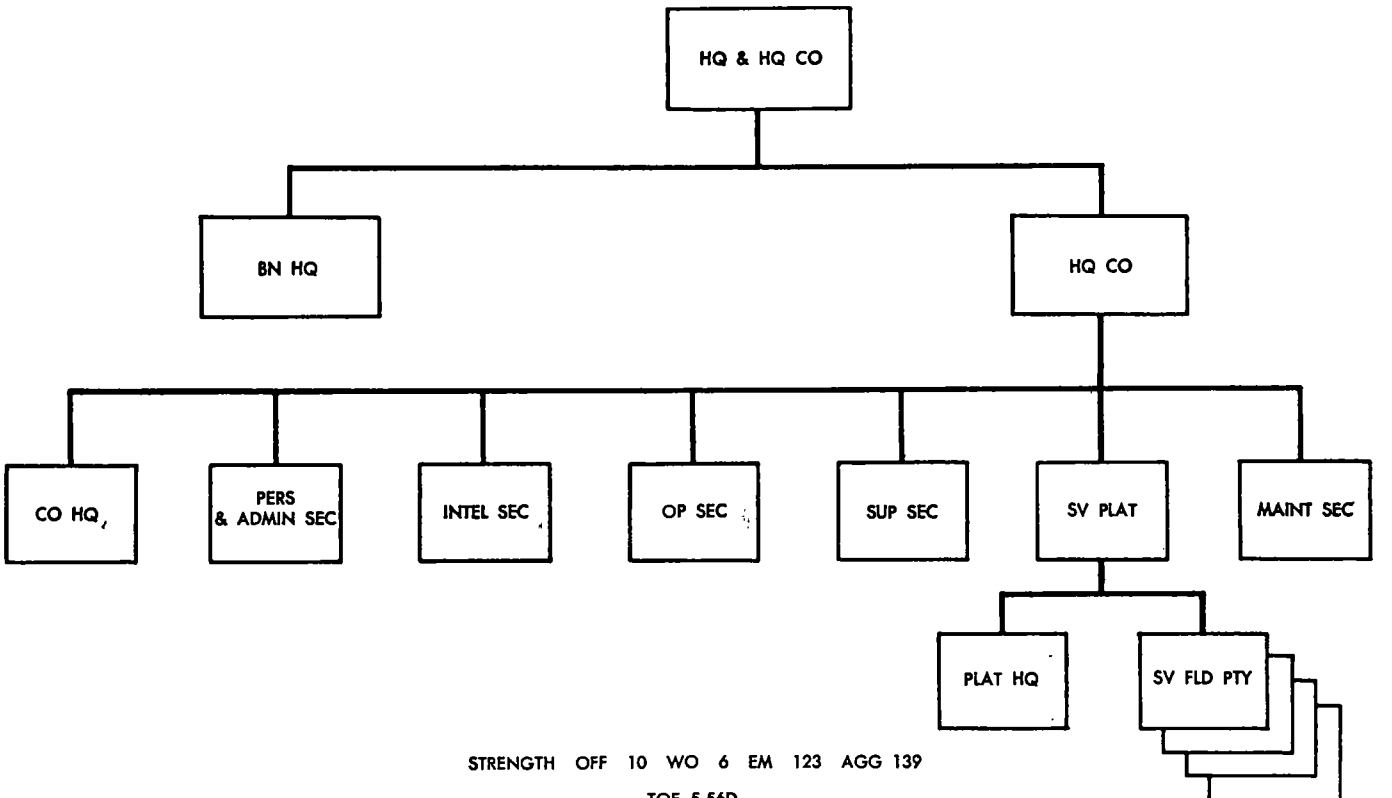


Figure 21. Organizational Chart Headquarters and Headquarters Company, Engineer Topographic Battalion, Army.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–55D.)

TOE 5–57D
ENGINEER MAP REPRODUCTION AND DISTRIBUTION COMPANY, ARMY

Section A. GENERAL

1. **Mission.** To reproduce, store and distribute new and existing maps, photomaps, overlays, and other intelligence material.

2. **Assignment.** Organic to Engineer Topographic Army, TOE 5–55D.

3. **Capabilities.** This unit is capable of—

a. Reproducing mapping and other intelligence material by lithography at a rate of approximately three million impressions per month.

b. Storing and distributing maps and similar material required by army troops and corps.

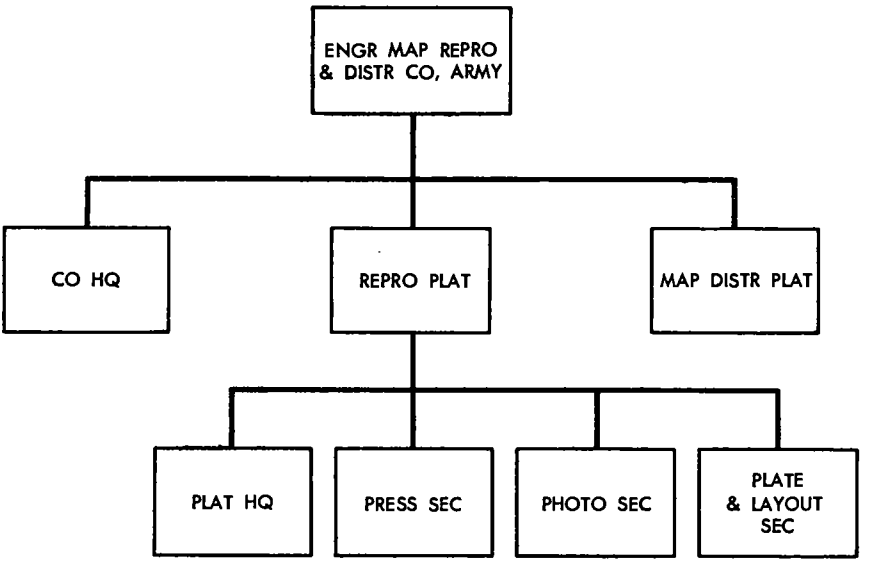
c. Individuals of this unit can fight as infantrymen when required. The unit has the capability of defending itself and its installation against hostile ground attack.

4. **Basis of Allocation.** One per Engineer Topographic Battalion, Army, TOE 5–55D.

5. **Category.** II.

6. **Mobility.** One hundred per cent.

Section B. ORGANIZATION (fig. 22)



STRENGTH OFF 4 WO 1 EM 106 AGG 111

TOE 5-57D

Figure 22. Organizational Chart Engineer Map Reproduction and Distributing Company, Army.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–55D.)

TOE 5–59D
ENGINEER PHOTOMAPPING COMPANY, ARMY

Section A. GENERAL

1. Mission. To compile original maps and map substitutes, and to revise existing planimetric and topographic maps and map substitutes.

2. Assignment. Organic to Engineer Topographic Battalion, Army, TOE 5–55D.

3. Capabilities. This unit is capable of—

a. Preparing maps, photomaps, overlays, sketches, drawings, and related material for reproduction.

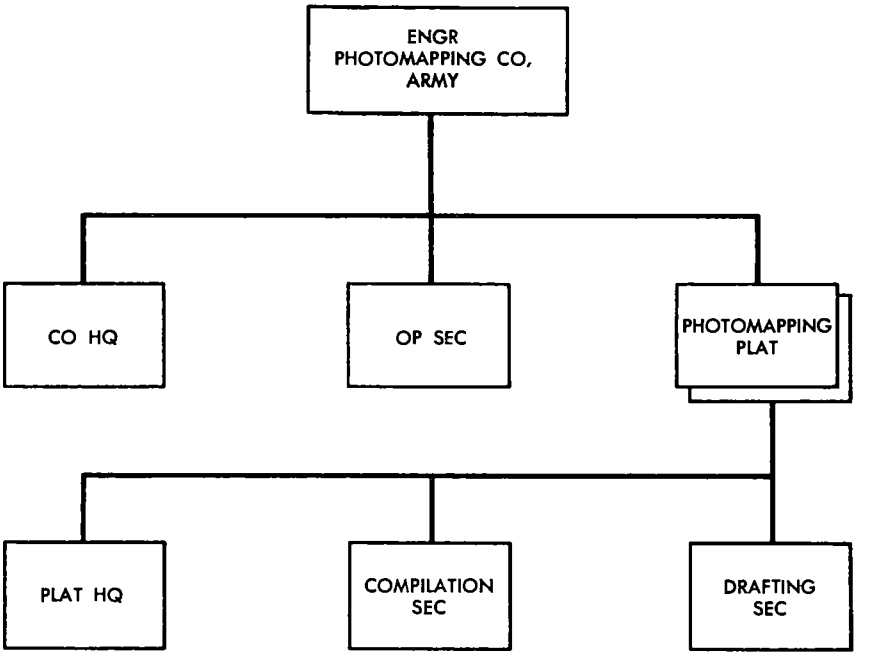
b. Individuals of this unit can fight as infantrymen when required. This unit has the capability of defending itself and its installation against hostile ground attack.

4. Basis of Allocation. One per Engineer Topographic Battalion, Army, TOE 5–55D.

5. Category. II.

6. Mobility. Thirty percent.

Section B. ORGANIZATION (fig. 23)



STRENGTH OFF 4 WO 1 EM 94 AGG 99

TOE 5-59D

Figure 23. Organizational Chart Engineer Photomapping Company, Army.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–55D.)

TOE 5–67D
ENGINEER WATER SUPPLY COMPANY

Section A. GENERAL

1. Mission. To produce and distribute potable water in the field.

2. Assignment. Assigned to type field army, communications zone, or similar headquarters.

3. Capabilities. This unit provides the following:

a. Installation and operation of nine separate water purification installations.

b. Purification and supply of approximately 27,000 gallons of potable water per hour with organic equipment.

c. Provides four 1500-gallon semitrailer water tanks and twelve 1000-gallon tank trucks capable of transporting 18,000 gallons from source to distribution point in one lift.

d. Reconnaissance of water sources and planning location and layout of water supply installations.

e. Limited rehabilitation and operation of civilian water supply facilities in territory under military control.

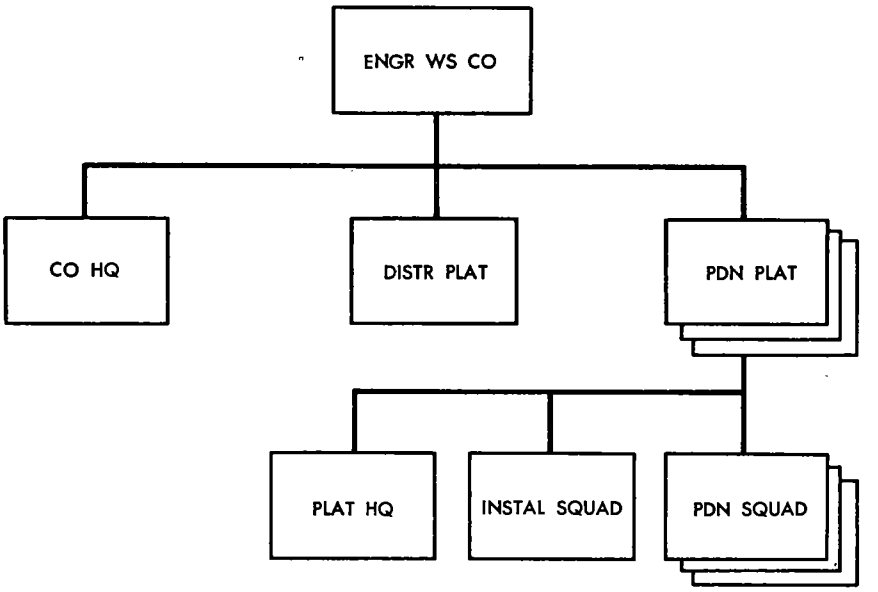
f. Individuals of this unit can fight as infantrymen when required. The unit has the capability of defending itself and its installations against hostile ground attack.

4. Basis of Allocation. One per type field army or one per 400,000 troops in communications zone.

5. Category. II.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 24)



STRENGTH OFF 5 EM 105 AGG 110

TOE 5-67D

Figure 24. Organizational Chart Engineer Water Supply Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons

Gun, machine cal. .50 HB	5
Launcher, rocket, 3.5 inch	2

Vehicles

Truck, cargo ¾-T	1
Truck, cargo 2½-T	11
Truck, dump 2½-T	3
Truck, water tank 2½-T	12
Truck, tractor, 5-T	4

Engineer Equipment

Hypochlorination unit, water purification 100 GPM	8
Pipefitting equipment set No. 2	1
Pump, centrifugal 50 ft head, 55 GPM	2
Semitrailer, tank, 1500 gal	4
Supplementary equipment set No. 16, water supply co.	8
Water purification equipment set, diatomite 3000 GPH set 4, portable	9
Water quality control set	9

TOE 5–77E
ENGINEER PANEL BRIDGE COMPANY

Section A. GENERAL

1. Mission. *a.* To provide technical personnel and equipment to load, maintain, and advise on erection of panel bridging.

b. To carry out missions of a dump truck company for earth moving and cargo hauling when bridging is immobilized.

2. Assignment. To field army or separate corps with attachment to Corps and Army Combat Groups, TOE 5–52D.

3. Capabilities. This unit is capable of—

a. Loading, transporting and maintaining one bridge set consisting of components to erect two 80-foot double truss, single story or one 130 ft double truss-double story, widened roadway, panel type bridge and bridge erection equipment.

b. Providing technical advice for erection.

c. Erecting bridges with organic personnel in an emergency.

d. Providing dump trucks for earth moving and general cargo hauling with approximately 160 tons capacity per lift when bridging is immobilized.

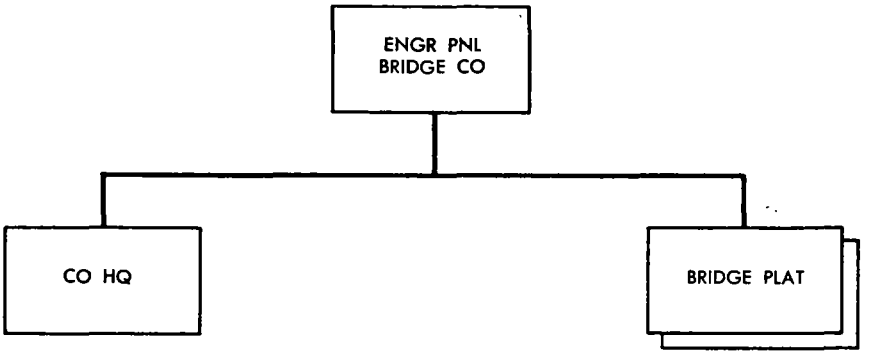
e. Individuals of this unit can engage in combat missions when required. It has the capability of defending itself and its installation against hostile ground attack.

4. Basis of Allocation. One per Engineer Combat Group, TOE 5–52D.

5. Category. II.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 25)



STRENGTH OFF 4 EM 124 AGG 128

TOE 5-77E

Figure 25. Organizational Chart Engineer Panel Bridge Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons

Gun machine 7.62-mm lw	2
Gun machine cal. .50 hvy bar	3
Launcher rocket 3.5-inch	3

Vehicles

Truck utility ¼-T	3
Truck cargo ¾-T	1
Truck cargo 2½-T	4
Truck dump 5-T	33
Truck tractor 5-T	1
Truck wrecker 5-T	1

Engineer Equipment

Bridge bailey 2–80 ft D–S	1
Tractor full-trackd med	1
Crane-shovel trk mtd 20-T ¾ yd	2

Signal

Radio set AN/GRC–19	1
Radio set AN/GRR–5	1
Radio set AN/VRC–10	4
Radio set AN/PRC–10	4

TOE 5–78E
ENGINEER FLOAT BRIDGE COMPANY

Section A. GENERAL

1. **Mission.** *a.* To provide technical personnel and equipment to load, maintain, and supervise erection of tactical stream crossing equipment.

b. Secondary mission of general cargo hauling in emergencies by immobilizing the bridge loads.

2. **Assignment.** To field army or separate corps with normal attachment to Engineer Combat Group, TOE 5–52.

3. **Capabilities.** This unit has the following capabilities:

a. Provide approximately 700 feet of M4T6 bridge or 5 four float and 5 five float M4T6 rafts or combinations of bridges and rafts.

b. Provide light streamcrossing equipage, assault boats, foot bridge and light tactical rafts in support of tactical river crossing operation.

c. Furnish technical supervision to assist other engineer units in bridge construction.

d. In emergency, construct bridges or rafts with organic personnel at a reduced rate.

e. By immobilizing bridging, can provide 60 5-ton and 35 2½-ton vehicles for cargo hauling.

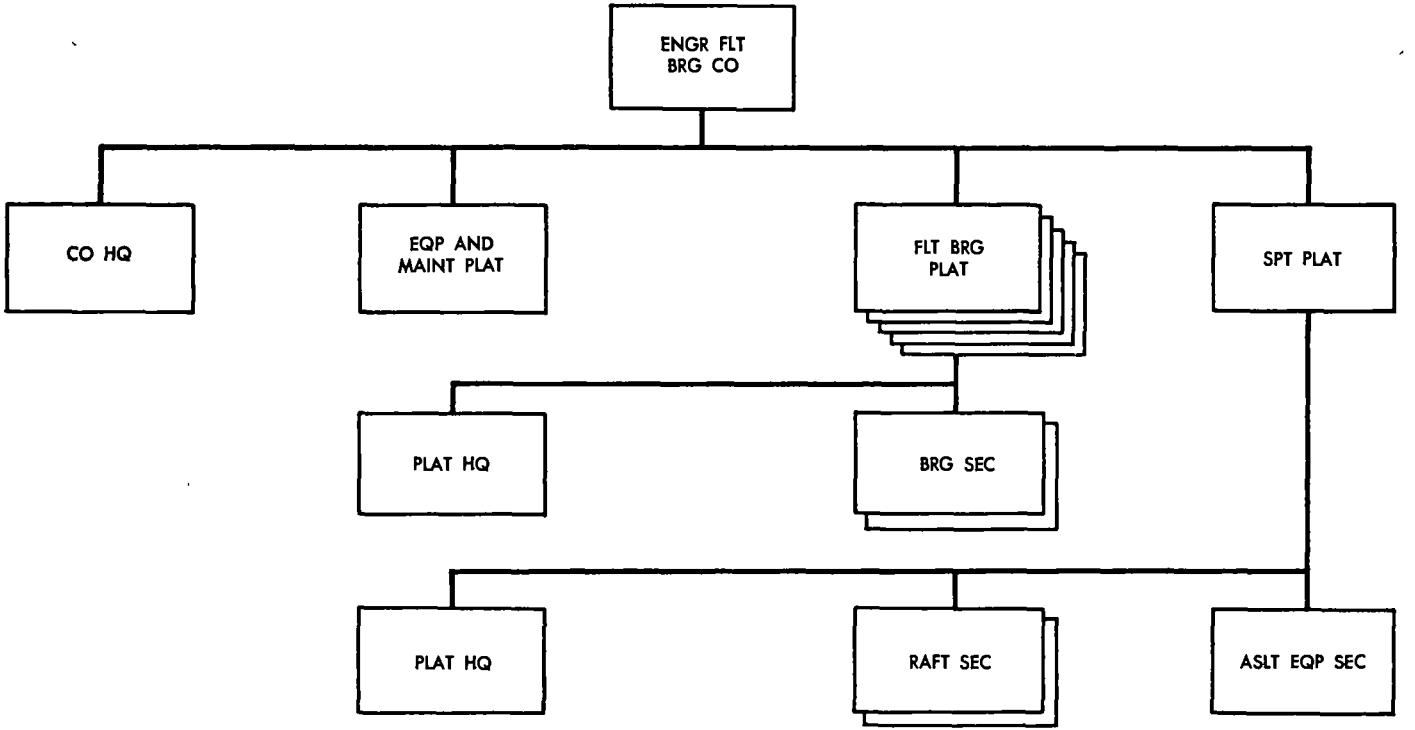
f. This unit has limited capability of defending itself and its installations against hostile ground attack.

4. **Basis of Allocation.** Two per corps and nine additional per field army.

5. **Category.** II.

6. **Mobility.** One hundred percent.

Section B. ORGANIZATION (fig. 26)



STRENGTH OFF 8 WO 1 EM 217 AGG 226

TOE 5-78E

Figure 26. Organizational Chart Engineer Float Bridge Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons

Gun machine cal. .50 HB	14
Launcher rocket 3.5-inch	4

Vehicles

Truck utility ¼-T	8
Truck cargo ¾-T	2
Truck cargo 2½-T	39
Truck tank fuel 2½-T	2
Truck wrecker 5-T	1
Truck stake 5-T	60

Engineer Equipment

Boat bridge 27 ft	10
Boat assault 15-man	70
Boat recon 3-man	10
Bridge floating foot	1
Bridge floating highway alum balk	5
Bridge floating light tactical raft	6
Crane-shovel trk mtd 20-T ¾ cu yd	2
Pneumatic tool and compressor outfit 210 CFM trlr mtd	2
Shop repair parts semitrlr mtd	1
Shop organzl repair light trk mtd	1
Tractor full trckd medium	1

Signal

Radio set AN/GRC–19	1
Radio set AN/GRR–5	1
Radio set AN/PRC–6	19
Radio set AN/VRC–10	9

TOE 5–96D
HEADQUARTERS AND HEADQUARTERS DETACHMENT, ENGINEER CAMOUFLAGE BATTALION

Section A. GENERAL

1. Mission. To provide an administrative and command headquarters of a flexible battalion to plan, supervise, and inspect camouflage work, discipline, and training, including use of deception devices.

2. Assignment. To communications zone or field army.

3. Capabilities. This unit is capable of providing—

a. Command and staff and supplemental technical skills and equipment for the camouflage battalion.

b. Personnel and equipment for the fabrication and maintenance of camouflage and deceptive devices.

c. Camouflage materials to attached or assigned units.

d. Supervision in the communications zone of from three to seven assigned camouflage companies.

e. This unit is dependent upon one of the attached companies for mess and motor maintenance.

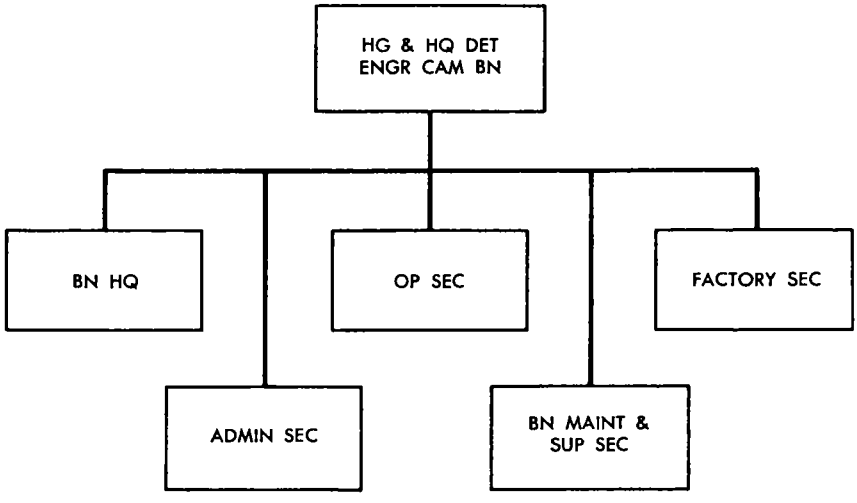
f. Individuals of this unit can fight as infantrymen when required. This unit has the capability of defending itself and its installations against hostile ground attack.

4. Basis of Allocation. One per field army.

5. Category. III.

6. Mobility. Eighty-five percent.

Section B. ORGANIZATION (fig. 27)



STRENGTH OFF 6 WO 3 EM 54 AGG 63

TOE 5-96D

Figure 27. Organizational Chart Headquarters and Headquarters Detachment, Engineer Camouflage Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck cargo ¾-T	1
Truck cargo 2½-T	1
Truck utility ¼-T	4

Engineer Equipment

Drafting equipment set bn	2
Reproduction set black and white process	1
Reproduction set spirit process	1
Spray outfit paint	1
Stereoscope lens aerial photo interpr. 4½" focal length	6
Supplemental equip. cam. bn.	1

Signal

Camera still KS–4	1
Processing equip PH–406	1

TOE 5–97E

ENGINEER CAMOUFLAGE COMPANY

Section A. GENERAL

1. **Mission.** To plan, supervise and inspect camouflage installations including deceptive devices. To supervise and inspect camouflage discipline and training.

2. **Assignment.** To engineer bridage or camouflage battalion of a field army.

3. **Capabilities.** This unit is capable of—

a. Performing above mission in zone of a field army or similar area.

b. Furnishing instruction teams for camouflage training for units in assigned area.

c. Preparing signs, posters, and other camouflage instructional material.

d. Supplying camouflage materials to unit in assigned area.

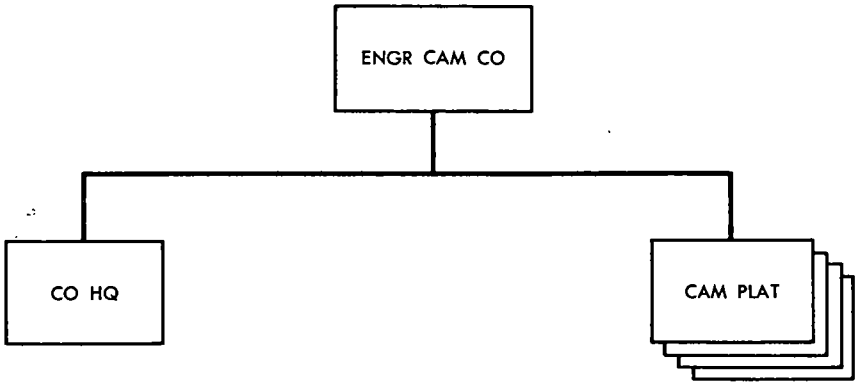
e. Individuals of this unit can fight as infantrymen when required. This unit has the capability of defending itself and its installations against hostile ground attack.

4. **Basis of Allocation.** One per corps.

5. **Category.** III.

6. **Mobility.** Eighty-five percent.

Section B. ORGANIZATION (fig. 28)



STRENGTH OFF 5 EM 64 AGG 69

TOE 5-97E

Figure 28. Organizational Chart Engineer Camouflage Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles	
Truck cargo ¾-T	9
Truck cargo 2½-T	2
Truck utility ¼-T	5
Engineer Equipment	
Camouflage training set company	1
Drafting equipment company	1
Pneu tool and comp outfit 210 cfm trlr mtd	1
Sign painting set	1
Stereoscope lens aerial photo interpr 4½-inch focal length	8
Tool kit pioneer portable electric tools	1
Signal	
Photographic set ES–12	1

TOE 5–112D

HEADQUARTERS AND HEADQUARTERS COMPANY ENGINEER CONSTRUCTION GROUP

Section A. GENERAL

1. Mission. *a.* To command and supervise assigned or attached units.

b. To perform engineer planning and design functions required in support of field construction.

c. To plan and coordinate the operation of a group consisting of construction or other units engaged in field construction, rehabilitation, or maintenance of facilities in support of Army or Air Force operation.

d. To provide local security and defense of its headquarters; in an emergency directs heterogeneous units in limited ground combat operations.

2. Assignment. Normally assigned to an engineer brigade, corps, field army, or communications zone.

3. Capabilities. This unit is capable of providing—

a. Technical, operational, and administrative control of from three to five engineer construction battalions and other assigned or attached engineer troops.

b. Design, planning, and supervision required for the construction or rehabilitation of routes of communication, buildings and installations, forward cargo and forward tactical air fields, heliports, minimal port petroleum storage and distribution facilities, and minimal port and railroad facilities.

c. Project assignment to subordinate units, allocation of troops and the allocation and coordination of construction equipment and materials.

d. Engineer reconnaissance by air and ground means.

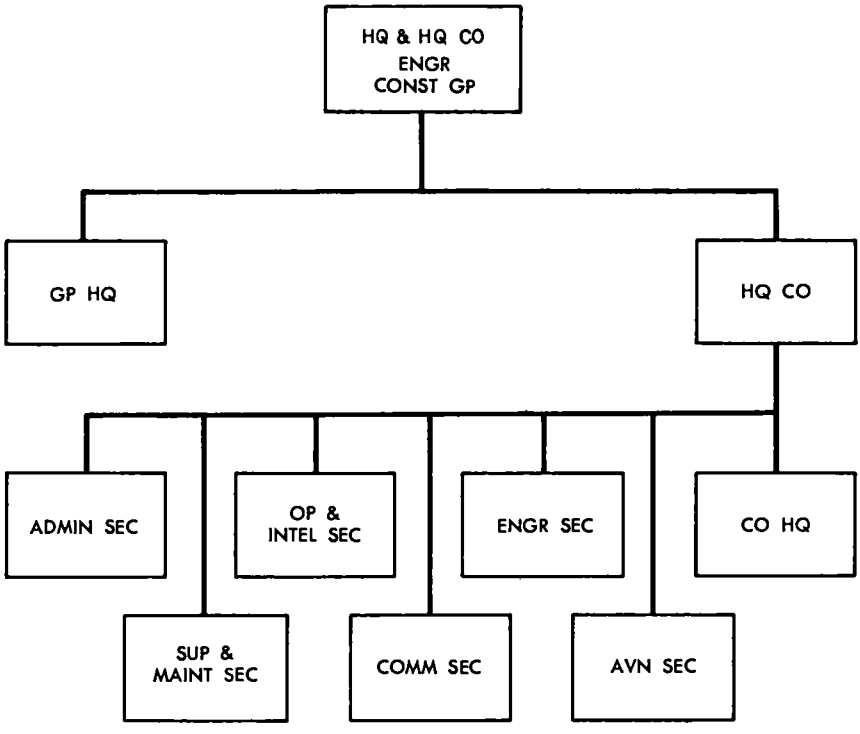
e. Fixed and rotary wing aircraft for support of the reconnaissance and construction activities of subordinate units.

4. Basis of Allocation. Normally one per three to five Engineer Construction Battalions, TOE 5–115.

5. Category. II.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 29)



STRENGTH OFF 17 WO 3 EM 78 AGG 98

TOE 5-112D

Figure 29. Organizational Chart Headquarters and Headquarters Company, Engineer Construction Group.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons

Gun machine 7.62 mm lw	2

Vehicles

Truck utility ¼-T	14
Truck cargo ¾-T	8
Truck cargo 2½-T	6

Engineer Equipment

Drafting equip set topo bn	1
Drafting machine 24 inch	4
Level survey abney	5
Reproduction set ammonia process	1
Reproduction set spirit process	1

Stereoscope lens aerial photointerpr 4½ inch focal length	1
Survey set gen purpose	2
Test set asphalt	1
Test set concrete	1
Test set soil	1

Signal

Radio set AN/GRC–19	8
Radio set AN/GRR–5	1
Radio set AN/VRC–34	1
Teletypewriter set AN/PGC–1	1

Aircraft

Airplane utility	1
Helicopter reconnaissance	1

TOE 5–114D

ENGINEER CONSTRUCTION SUPPORT COMPANY

Section A. GENERAL

1. Mission. *a.* To support engineer contruction efforts with specialized equipment and operator personnel.

b. To provide local defense.

2. Assignment. To field army or communications, zone, normally attached to an Engineer Construction Group.

3. Capabilities. *a.* Operates in support of an engineer group engaged in construction efforts involving earthwork and surfacing operations.

b. Furnishes support to other units by attachments of personnel and equipment thereto.

c. Provides personnel and equipment as required for extensive quarrying operations and for bituminous surfacing operations.

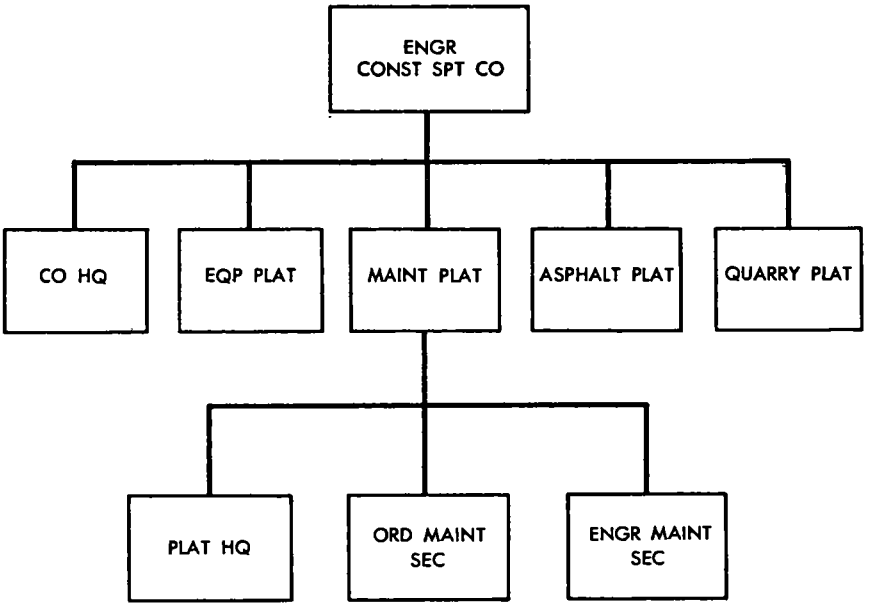
d. Performs organizational maintenance on organic ordnance vehicles and organizational and third echelon maintenance on engineer construction equipment.

4. Basis of Allocation. Normally one per Engineer. Construction Group, TOE 5–112D.

5. Category. II.

6. Mobility. Seventy-five percent.

Section B. ORGANIZATION (fig. 30)



STRENGTH OFF 5 WO 1 EM 160 AGG 166

TOE 5-114D

Figure 30. Organizational Chart Engineer Construction Support Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons

Gun machine 7.62 mm/w	9
Launcher rocket 3.5 inch	3

Vehicles

Tank fuel servicing 2½-T	1
Truck utility ¼-T	5
Truck cargo ¾-T	1
Truck cargo 2½-T	4
Truck dump 5-T	10
Truck tractor 5-T	4
Truck wrecker 5-T	1
Truck tractor 10-T	4

Engineer Equipment

Asphalt mixing and paving set 120 TPH	1
Bin storage aggregate 60-T	2
Cleaner steam	1
Compressor whl mtd 600 cim	3

Crane shovel crlr mtd 40-T 2 cu yd	4
Crane shovel trk mtd 20-T ¾ cu yd	1
Crushing and screening plant 75 TPH	1
Distributor bitumin trk mtd 800 gal	1
Distributor water trk mtd 1000 gal	1
Hammer pile driver	2
Intrenching machine combat	1
Lubricating and servicing unit trlr mtd	1
Paving machine	1
Rock drilling equip	1
Roller mtzd tand med	2
Roller mtzd tand hvy	1
Roller towed pneu tired 13 whl	2
Semitrailer 60-T	5
Semitrailer repair parts	1
Semitrailer tank gasoline 5000 gal	1
Shop contact maintenance trk mtd	1
Shop general purpose rep tlr mtd	1
Spreader aggreg towed	2
Sweeper rotary towed	2
Test set asphalt	1
Tractor full trckd hvy	2
Tractor whl 20,000 to 27,000 DBP	2
Trailer flat bed 10-T	5
Washing and screening plant 75 TPH	1

Signal

Radio set AN/GRR-5	1
Radio set AN/VRC-34	2

TOE 5–115D
ENGINEER CONSTRUCTION BATTALION

Section A. GENERAL

1. Mission. *a.* In the theater of operations to construct and rehabilitate roads, airfields, pipeline systems, structures, and utilities for the Army and the Air Force in the communications zone, rear areas of the combat zone and in support of airborne and beach operations; and to assist emergency recovery operations.

b. To defend construction sites during construction.

2. Assignment. In the theater of operations for further assignment to corps, field army or communications zone. Normally attached to an engineer construction group.

3. Capabilities. *a.* With organic units this unit is capable of—

(1) Construction or rehabilitation of routes of communication, bridges, forward tactical and forward cargo airfields and heliports.

(2) Construction of buildings, structures, and related facilities.

(3) Construction of pipelines and storage tanks.

(4) Reconstruction of railroads, ports, depots, hospitals, and utilities.

(5) Limited bituminous paving.

(6) Organizational and third echelon maintenance for organic engineer equipment to include major unit replacements.

(7) Minor protective construction.

(8) Sustained operations on two-shift basis.

(9) Medical service for the battalion to include emergency medical treatment, operation of battalion aid station, evacuation of sick and injured personnel when practicable and supervision of sanitation in the battalion.

(10) Generating potable water.

b. When supported by attachments of specialized personnel and equipment the battalion is capable of—

(1) Large-scale bituminous and concrete paving operations.

(2) Large-scale quarrying and crushing operations.

(3) Major reconstruction of railroads and railroad bridges.

(4) Major rehabilitation of ports.

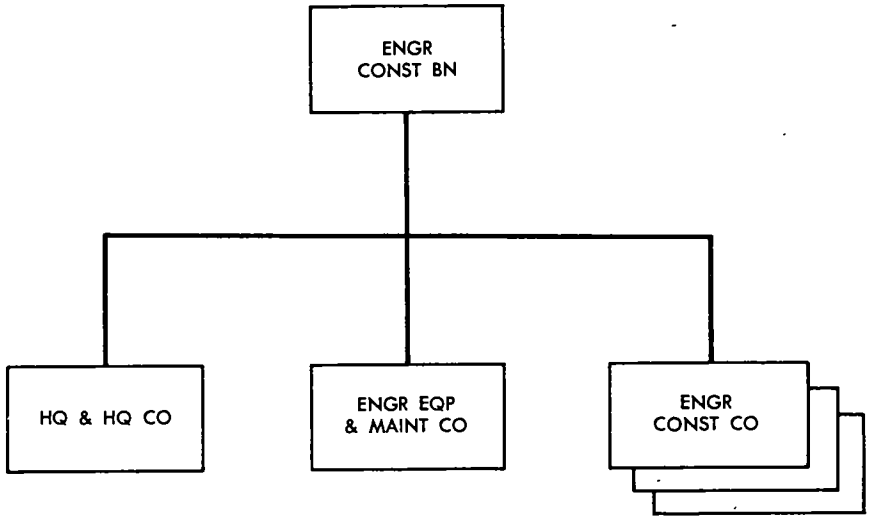
(5) Major protective construction.

4. **Basis of Allocation.** Three to five per Engineer Construction Group.

5. **Category.** II.

6. **Mobility.** Ninety-five percent.

Section B. ORGANIZATION (fig. 31)



STRENGTH OFF 29 WO 12 EM 850 AGG 891

TOE 5-115D

Figure 31. Organizational Chart Engineer Construction Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

	AGG Breakdown Within Organic Units			
	5–115D	*5–116D*	*5–117D*	*5–118D*
Weapons				
Gun machine 7.62 mm lw	28	4	6	6
Launcher rocket 3.5-inch	15	1	2	4
Vehicles				
Truck utility ¼-T	28	9	4	5
Truck cargo ¾-T	26	7	4	5
Truck cargo 2½-T	35	9	11	5
Truck ambulance ¾-T	1	1		
Truck tank fuel 2½-T	8	--	2	2
Truck dump 5-T	47	--	11	12
Truck, wrecker 5-T	1	--	1	

Truck tractor	3		3	
Truck tractor 10-T	16		4	4

Engineer Equipment	*AGG Breakdown Within Organic Units*			
	5-115D	*5-116D*	*5-117D*	*5-118D*
Auger earth skid mtd 9 ft bore	1	--	1	
Cleaner steam whl mtd	1	--	1	
Compressor whl mtd 600 cfm	1	--	1	
Crane shovel trk mtd 20-T ¾ cu yd	6	--	--	2
Crane shovel crlr mtd 10-T ¾ cu yd	2	--	2	
Crushing and screening plant 75 tph	1	--	1	
Distributor bitumin trk mtd 800 gal	2	--	2	
Distributor water trk mtd 1000 gal	6	--	--	2
Drafting and duplicating set small	3	--	--	1
Drafting equip set bn	3	3		
Generator 100 kw	2	--	2	
Generator set 10 kw	10	4	--	2
Grader road mtzd hvy	9	--	--	3
Intrenching machine combat	2	--	2	
Kettle bitumin skid mtd 750 gal	1	--	1	
Kettle bitumin trlr mtd 165 gal	1	--	1	
Loader scoop 4 whl 2½ cu yd	6	--	3	1
Lubricating and servicing unit trlr mtd	7	--	4	1
Mixer concrete trlr mtd 16 cu ft	6	--	--	2
Pipeline const equip trk mtd	2	--	2	
Pneumatic tool and compressor outfit 210 cfm trlr mtd.	7	--	1	2
Reproduction set ammonia process	1	1		
Reproduction set spirit process	1	1		
Rock drilling equip	1	--	1	
Roller mtzd 2 roll med	1	--	1	
Roller mtzd 10-T w/scarif and sprink	3	--	--	1
Roller towed sheepsfoot	6	--	--	2
Roller towed pneu tired 50-T	3	--	--	1
Rooter	6	--	--	2
Scraper towed 18 cu yd	24	--	6	6
Semitrailer low bed 25-T	22	--	4	6
Semitrailer repair parts 6-T	3	--	3	
Shop contact maint trk mtd	7	--	4	1
Shop equip woodworking trlr mtd	6	--	--	2
Shop general purpose repair semitrlr mtd	1	--	1	
Shop organzl repair	1	--	1	
Spreader aggregate towed	4	--	4	
Survey set general purpose	2	2		
Sweeper rotary towed	1	--	1	
Test set asphalt	1	1		
Test set soil	1	1		
Tractor whl 20,025 to 27,000 dbh	35	--	8	9
Tractor full trckd hvy w/dozer blade	13	--	1	4
Trailer flat bed 10-T	1	--	1	
Truck lift	1	--	1	
Vibrator concrete	12	--	--	4
Water purification set trk mtd 1500 gph	2	2		

Water quality control set	2	2		
Welding shop trlr mtd	5	--	2	1

	AGG Breakdown Within Organic Units			
Signal	*5-115D*	*5-116D*	*5-117D*	*5-118D*
Camera KS-4	1	1		
Detector set AN/PRS-3	5	1	1	1
Processing equipment PH-406	1	1		
Processing unit PH-668/U	1	1		
Radio set AN/GRC-19	7	3	1	1
Radio set AN/VRC-34	18	2	1	5
Radio set AN/GRR-5	5	1	--	1
Radio set AN/VRC-10	1	1		
Receiver radio R-392/URR	1	1		

TOE 5–116D

HEADQUARTERS AND HEADQUARTERS COMPANY ENGINEER CONSTRUCTION BATTALION

Section A. GENERAL

1. Mission. *a.* To provide command, planning, direction, coordination and control of the battalion and attached units.

b. To provide local defense.

2. Assignment. Organic to the Engineer Construction Battalion, TOE 5–115.

3. Capabilities. This unit is capable of—

a. Providing command and staff function for the battalion.

b. Furnishing administrative, supply, medical and air transportation, when augmented, services to units in the battalion.

c. Performing air, when augmented, and ground reconnaissance, initial and final surveys for battalion projects.

d. Preparing and furnishing construction layouts and site adaptations.

e. Providing technical advice and direction and furnishing overall supervision for construction projects.

f. Providing and supervising battalion communication and providing wire communication for local subordinate units.

g. Providing tactical intelligence for the battalion.

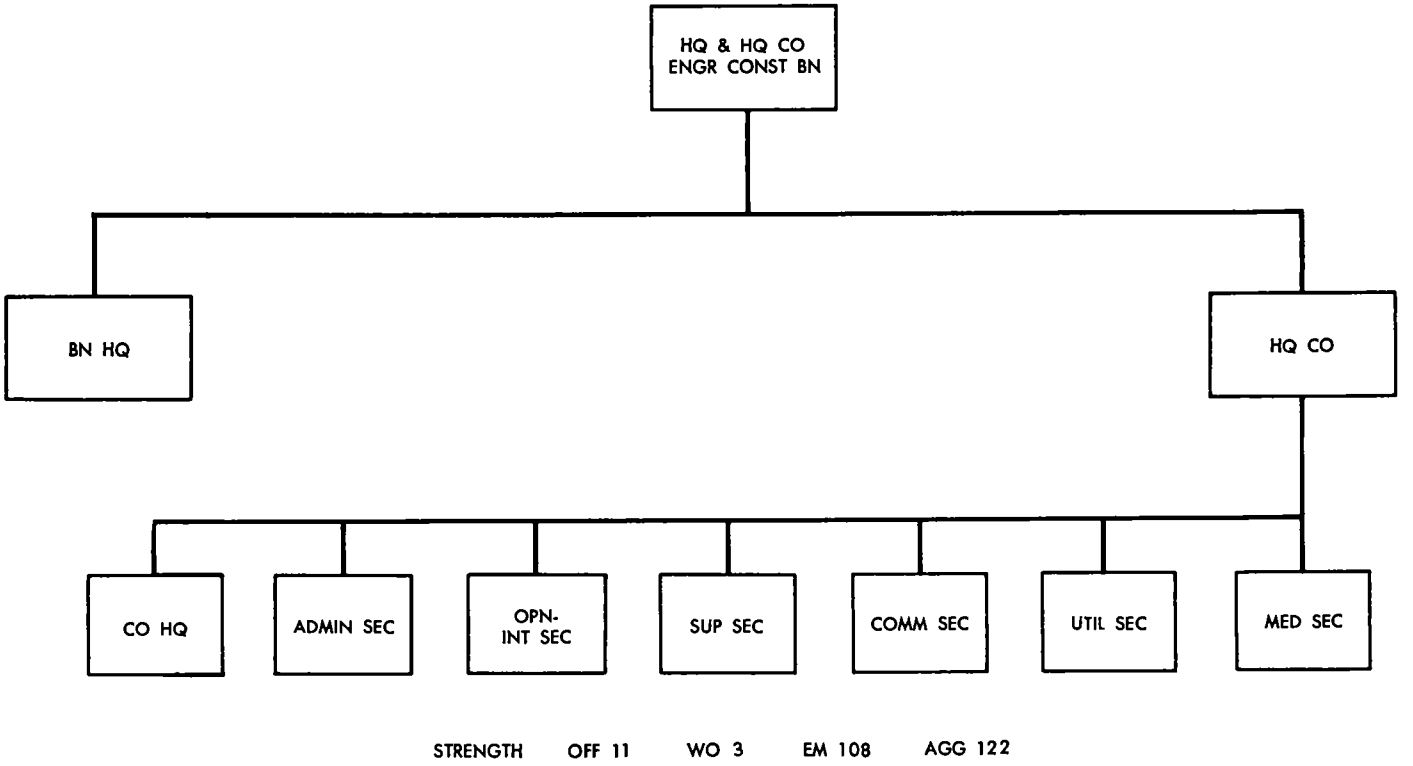
h. Coordinating equipment requirements of the companies and effecting temporary interchanges when operational requirements dictate.

4. Basis of Allocation. One per Engineer Construction Battalion, TOE 5–115.

5. Category. II.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 32)



TOE 5-116D

Figure 32. Organizational Chart Headquarters and Headquarters Company, Engineer Construction Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–115D.)

TOE 5–117D
ENGINEER EQUIPMENT AND MAINTENANCE COMPANY

Section A. GENERAL

1. Mission. *a.* To provide third echelon maintenance to all elements of the battalion and to support the three construction companies with construction specialists and specialized equipment with operators.

b. To provide local defense.

2. Assignment. Organic to the Engineer Construction Battalion, TOE 5–115.

3. Capabilities. This unit is capable of—

a. Providing third echelon maintenance for organic engineer equipment and ordnance vehicles.

b. Providing contact maintenance teams for "job-site" repair of equipment.

c. Providing repair parts support.

d. Operating machine shop and metal-fabrication facilities.

e. Maintaining and operating heavy equipment, not available in the construction companies, for utilization on specialized construction projects.

f. Providing its own administration, supply, mess, and organizational maintenance.

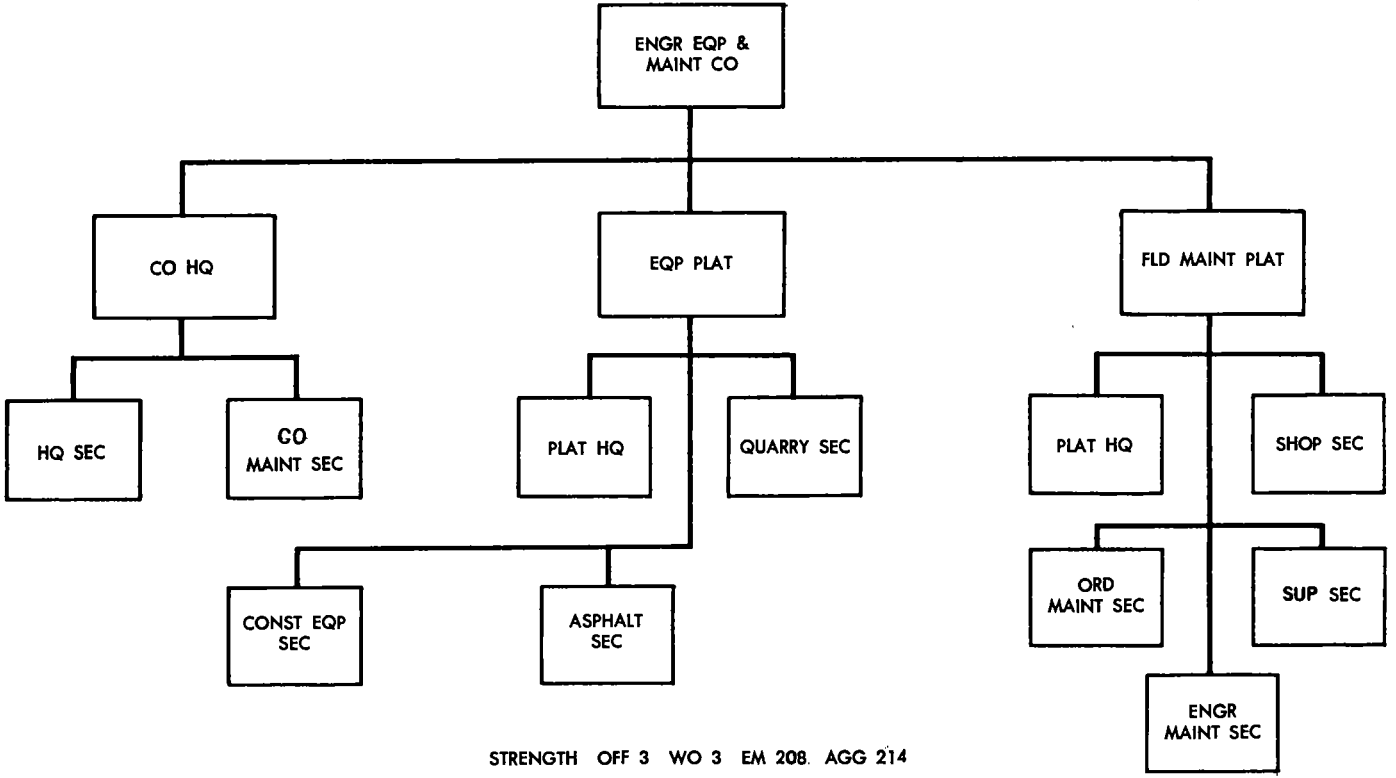
g. Supporting double-shift operations.

4. Basis of Allocation. One per Engineer Construction Battalion, TOE 5–115.

5. Category. II.

6. Mobility. Ninety percent mobile.

Section B. ORGANIZATION (fig. 33)



STRENGTH OFF 3 WO 3 EM 208 AGG 214

TOE 5-117D

Figure 33. Organizational Chart Engineer Equipment and Maintenance Company.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–115D.)

TOE 5–118D

ENGINEER CONSTRUCTION COMPANY

Section A. GENERAL

1. Mission. *a.* To excavate, haul, compact and grade earth; and to provide stabilized earth subgrades for airfields, roads, railroads, levees, supply storage areas and similar projects.

b. To construct and rehabilitate buildings, port facilities, bridges and drainage structures, pipelines and storage tanks and related facilities; and to install and repair utilities.

c. To perform bomb-damage recovery for the Army and the Air Force.

d. To defend construction sites.

2. Assignment. Organic to the Engineer Construction Battalion, TOE 5–115.

3. Capabilities. This unit is capable of—

a. Operating borrow pits and hauling borrow-pit material; performing cut and fill; compacting natural or fill material to provide subgrades of specified bearing strength; and leveling natural or fill material to desired grades.

b. Constructing or rehabilitating theater of operations type buildings, shelters and operational facilities; and erecting prefabricated structures.

c. Installing electrical, water and sewage facilities for theater-of-operations installations.

d. Performing heavy general construction, when augmented.

e. Providing construction effort for bomb-damage recovery operations.

f. Providing its own administration, supply, mess and full organizational maintenance.

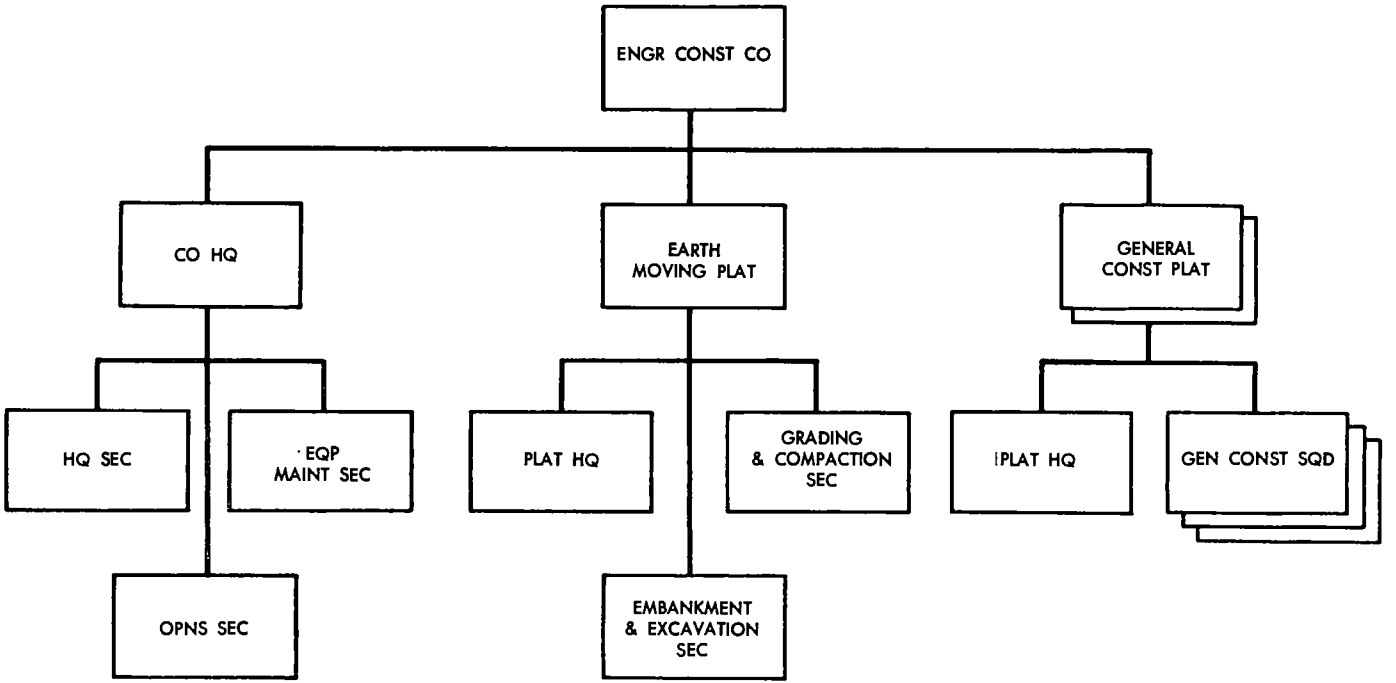
g. Operating double shift.

4. Basis of Allocation. Three per Engineer Construction Battalion, TOE 5–115.

5. Category. II.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 34)



STRENGTH OFF 5 WO 2 EM 178 AGG 185

TOE 5-118D

Figure 34. Organizational Chart Engineer Construction Company.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–115D.)

TOE 5–124D

ENGINEER DUMP TRUCK COMPANY

Section A. GENERAL

1. Mission. Operation of dump trucks for movement of bulk materials in support of other engineer units.

2. Assignment. To army or communications zone, normally attached to an engineer group.

3. Capabilities. *a.* This unit is capable of moving a maximum of 240 cubic yards of bulk material such as gravel, dirt, or crushed stone, per trip. The amount of material that this unit can haul in one day depends on various factors, such as weather conditions, distance of haul, roadway, material, or loading facilities.

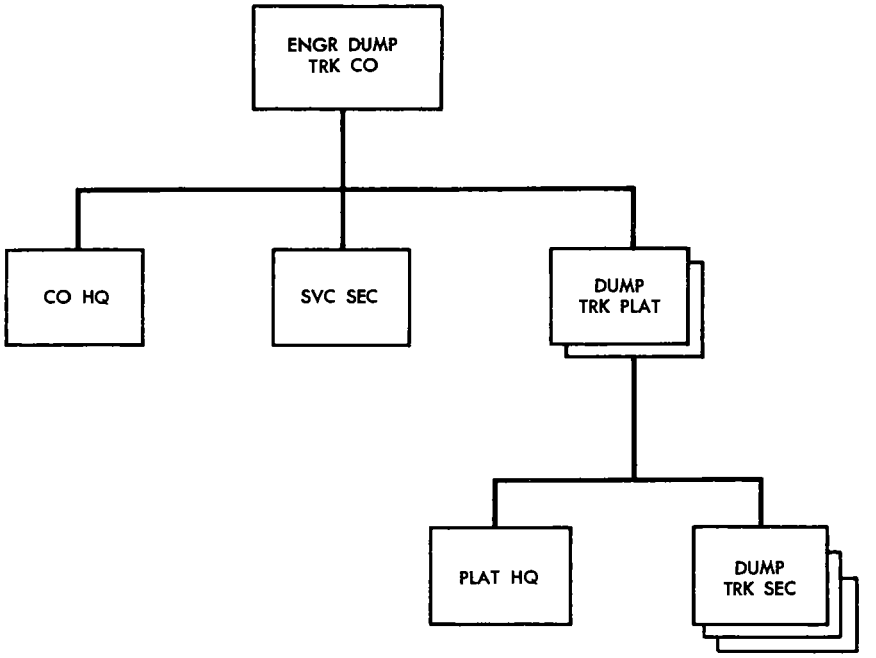
b. Individuals of this unit can fight as infantrymen, when required. This unit has the capability of defending itself and its installation against hostile ground attack.

4. Basis of Allocation. One per each engineer combat or engineer construction group.

5. Category. III.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 35)



STRENGTH OFF 3 WO 1 EM 104 AGG 108

TOE 5-124D

Figure 35. Organizational Chart Engineer Dump Truck Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck, utility ¼-T	3
Truck, cargo ¾-T	2
Truck, cargo 2½-T	1
Truck, tank gasoline 2½-T	1
Truck, dump 5-T	48
Truck, wrecker 5-T	1

Engineer Equipment

Lubricating and servicing unit trlr mtd	1

Signal

Radio set AN/GRR–5	1
Radio set AN/VRC–34	4

TOE 5–129D
ENGINEER PORT CONSTRUCTION COMPANY

Section A. GENERAL

1. Mission. To perform special engineering work involved in providing port, beach and marine POL facilities in support of military operations.

2. Assignment. Normally assigned to communications zone as required. May be assigned to a field army as required, during stages of construction and complete rehabilitation of port facilities.

3. Capabilities. *a.* Operating in conjunction with other engineer units, performing specialized tasks in the construction and complete rehabilitation of port facilities and construction of beach facilities.

b. Intallation and/or rehabilitation of tanker unloading facilities to include submarine pipeline and limited construction and/or rehabilitation of on shore POL storage facilities.

c. Performing organizational and third echelon maintenance of organic engineer equipment.

d. Performing two shift operations.

e. Individuals of this unit can fight as infantry when required. This unit has the capability of defending itself and its installations against hostile ground attack.

4. Basis of Allocation. Normally one per base logistical command.

5. Category. III.

6. Mobility. Fifty percent. One hundred percent under conditions favoring concurrent land and water movement.

Section B. ORGANIZATION (fig. 36)

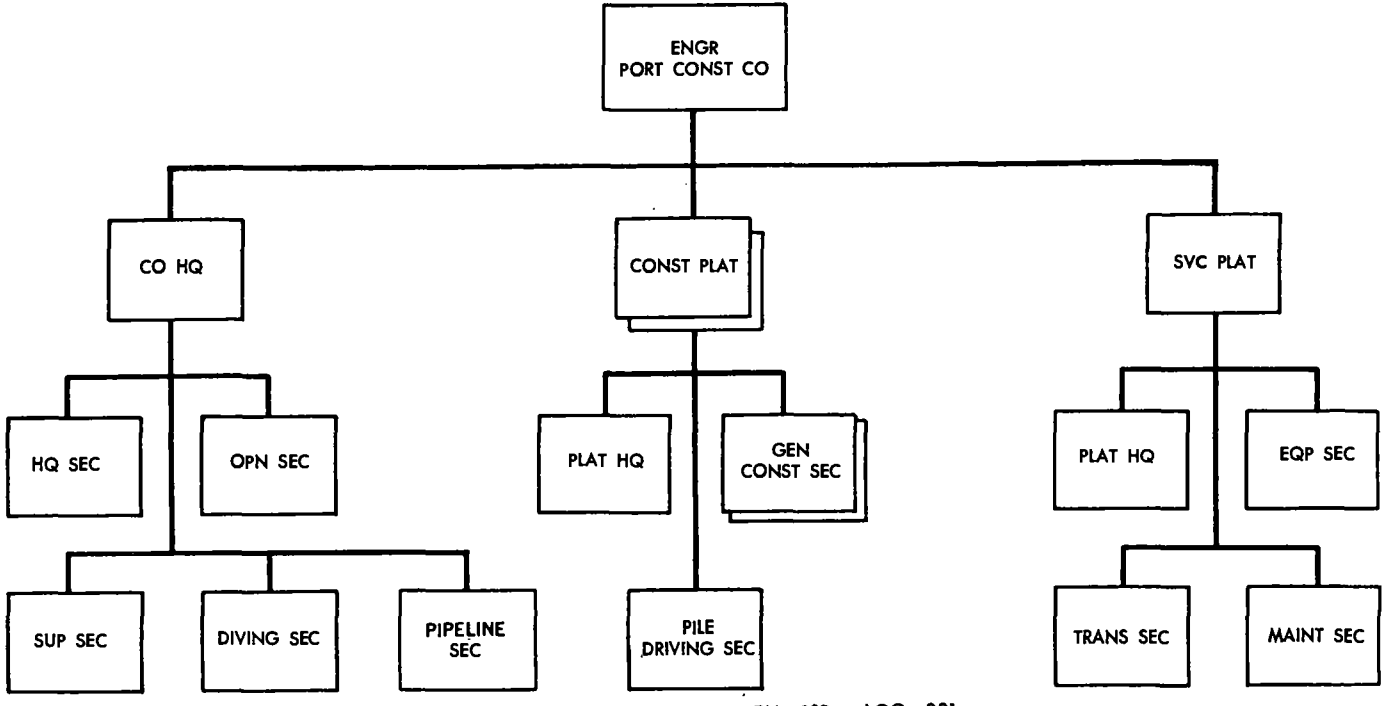


Figure 36. Organizational Chart Engineer Port Construction Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck utility ¼-T	6
Truck cargo ¾-T	4
Truck cargo 2½-T	10
Truck tank gasoline 2½-T	1
Truck bolster 2½-T	2
Truck dump 5-T	4
Truck tractor 5-T	1
Truck wrecker 5-T	1
Truck tractor 10-T	4
Semitrailer low-bed 25-T	4

Engineer Equipment

Boat bridge 27-ft	2
Compressor whl mtd 600 cfm	4
Crane shovel crlr mtd 10-T ¾ cu yd	1
Crane shovel crlr mtd 40-T 2 cu yd	2
Crane shovel trk mtd 20-T ¾ cu yd	2
Diving equipment set 2-person 200 ft	3
Diving equipment set 2-person 100 ft	3
Drafting equip set bn	4
Extractor pile	2
Jetting set portable pile driving	2
Level survey abney	1
Loader scoop 4 wheel 2½ cu yd	1
Lubricating and servicing unit trlr mtd	1
Mixer concrete trlr mtd 16 cu ft	2
Pneumatic tool outfit 315 cfm	4
Pneumatic tool and compressor outfit 210 cfm	3
Pump centrf 70 ft head 166 gpm	2
Reproduction set black and white process	1
Reproduction set spirit process	1
Semitrailer repair parts	1
Shop contact maintenance trk mtd	1
Shop general purpose repair semitrailer	1
Survey set general purpose	1
Tool outfit pioneer portable elect	1
Tractor full tracked hvy	3
Trailer flat bed 10-ton	5
Trailer low bed 60-ton	1
Welding shop trlr mtd	3

Transportation Equipment

Barge assembly set 3 by 7	1
Barge assembly set 5 by 12	4
Barge assembly set 6 by 18	2
Landing craft mechanized 69 ft	2

Signal

Radio set AN/GRC–19	1
Radio set AN/GRR–5	1
Radio set AN/PRC–10	5

TOE 5–167C
ENGINEER TOPOGRAPHIC COMPANY, CORPS

Section A. GENERAL

1. **Mission.** To provide map and survey information in support of corps operations.

2. **Assignment.** One per corps.

3. **Capabilities.** *a.* Preparation of sketches, drawings, maps, and map substitutes.

b. Reproduction of existing maps and other intelligence material.

c. Distribution of maps and similar materials.

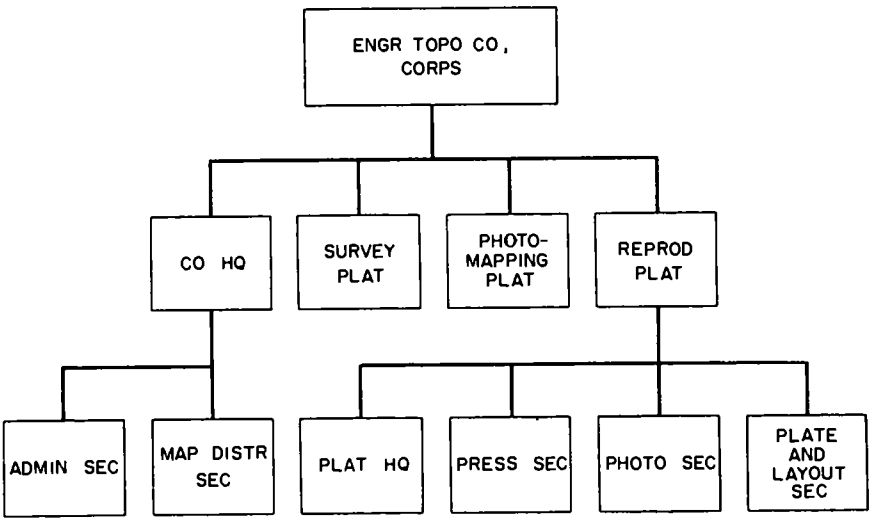
d. Accomplishment of surveys as required for topographic mapping and to furnish geodetic control for the use of the field artillery.

4. **Basis of Allocation.** One per type corps.

5. **Category.** II.

6. **Mobility.** Ninety-two percent.

Section B. ORGANIZATION (fig. 37)



STRENGTH OFF 4 WO 3 EM 107 AGG 114

TOE 5-167C

Figure 37. Organizational Chart Engineer Topographic Company, Corps.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons	
Gun machine Cal. 50 hb	3
Vehicles	
Truck utility ¼-T	5
Truck cargo ¾-T	6
Truck cargo 2½-T	6
Engineer Equipment	
Camera sect topo repro set trk mtd	1
Cartographic sect topo map set trk mtd	1
Copy and supply sect topo set trk mtd	1
Drafting equip set supplemental	6
Generator set skd mtd 30 kw	2
Map distribution equip set No 1	1
Map revision sect topo mapping set trk mtd	1
Photo print & process sect topo reprod set trk mtd	1
Photomapping sect topo map set trk mtd	1
Plate grainer sect topo reprod set trk mtd	1
Plate process sect topo reprod set trk mtd	1
Press sect topo reprod set trk mtd	2
Rectifier section topo reprod set trk mtd	1
Tellurometer master unit	2
Tellurometer remote unit	4
Water purification equip set trlr mtd 600 gph	1
Water quality control set No. 1	1
Signal	
Radio set AN/GRC–19	1
Radio set AN/VRC–8	4

TOE 5–177D
ENGINEER PIPELINE EQUIPMENT COMPANY

Section A. GENERAL

1. Mission. To provide technical personnel and specialized equipment to assist construction units in the construction and rehabilitation of pipeline systems.

2. Assignment. To theater of operations. Normally attached to Engineer Construction Group, TOE 5–112.

3. Capabilities. *a.* Provides technical skills and specialized equipment to Engineer units engaged in pipeline construction.

b. To a limited degree can construct pipeline systems, including the erection of storage tanks.

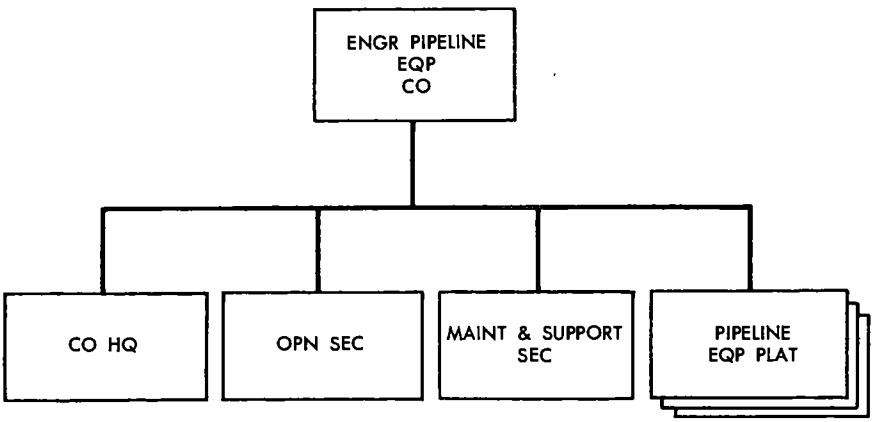
c. This unit has a limited capability of defending itself and its installation against hostile ground attack.

4. Basis of Allocation. One per Engineer Construction Group engaged in pipeline construction.

5. Category. II.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 38)



STRENGTH OFF 5 WO 1 EM 178 AGG 184

TOE 5-177D

Figure 38. Organizational Chart Engineer Pipeline Equipment Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons

Gun machine 7.62 mm lw	5
Launcher rocket 3.5 inch	5

Vehicles

Semitrailer low bed 25-T	1
Truck utility ¼-T	5
Truck cargo ¾-T	8
Truck cargo 2½-T	11
Truck wrecker 5-T	1
Truck tractor 10-T	1

Engineer Equipment

Crane shovel trk mtd 20-T ¾ cu yd	1
Drafting equip set bn	1
Erection outfit high storage tanks	4
Erection outfit low storage tanks	3
Lapping machine metal working	1
Loader scoop 4 whl 2¼ cu yd	1
Lubricating and servicing unit trlr mtd	1
Pipeline construction equip trk mtd	3
Pneumatic tool and compressor outfit 210 cfm trlr mtd	1
Shop contact maint trk mtd	1
Shop organzl repair trk mtd	1
Shop welding trlr mtd	6
Survey set general purpose	1
Tool outfit pioneer portable elect tools	3
Tractor full trckd hvy	1
Trailer bolster 2½-T	15
Truck bolster 2½-T	15

Signal

Radio set AN/GRC-19	1
Radio set AN/GRR-5	1
Radio set AN/VRC-34	4

TOE 5–214D

ENGINEER COMPANY REDSTONE

Section A. GENERAL

1. **Mission.** *a.* To provide the liquid oxygen and carbon dioxide or liquid nitrogen necessary to support the operations of a REDSTONE Missile Group or Battalion.

b. To provide field maintenance and repair support for the mechanical engineer equipment of the REDSTONE Missile Group.

2. **Assignment.** Organic to the Field Artillery Missile Group (Heavy), TOE 6–610 or the Field Artillery Missile Group, REDSTONE, TOE 6–630.

3. **Capabilities.** This unit has the following capabilities:

a. To manufacture liquid oxygen at a sustained rate of 25 tons per day.

b. To store 134 tons of liquid oxygen in on-plant and mobile storage equipment.

c. To manufacture dry ice at the rate of 2000 pounds per day when augmented by Augmentation Carbon Dioxide Generating Sections, or to manufacture liquid nitrogen at a sustained rate of 5000 pounds per day when augmented by the Liquid Nitrogen Supply Sections.

d. To provide field maintenance and repair parts support for organic engineer mechanical equipment of the REDSTONE Missile Group.

e. To transport and transfer liquid oxygen and dry ice.

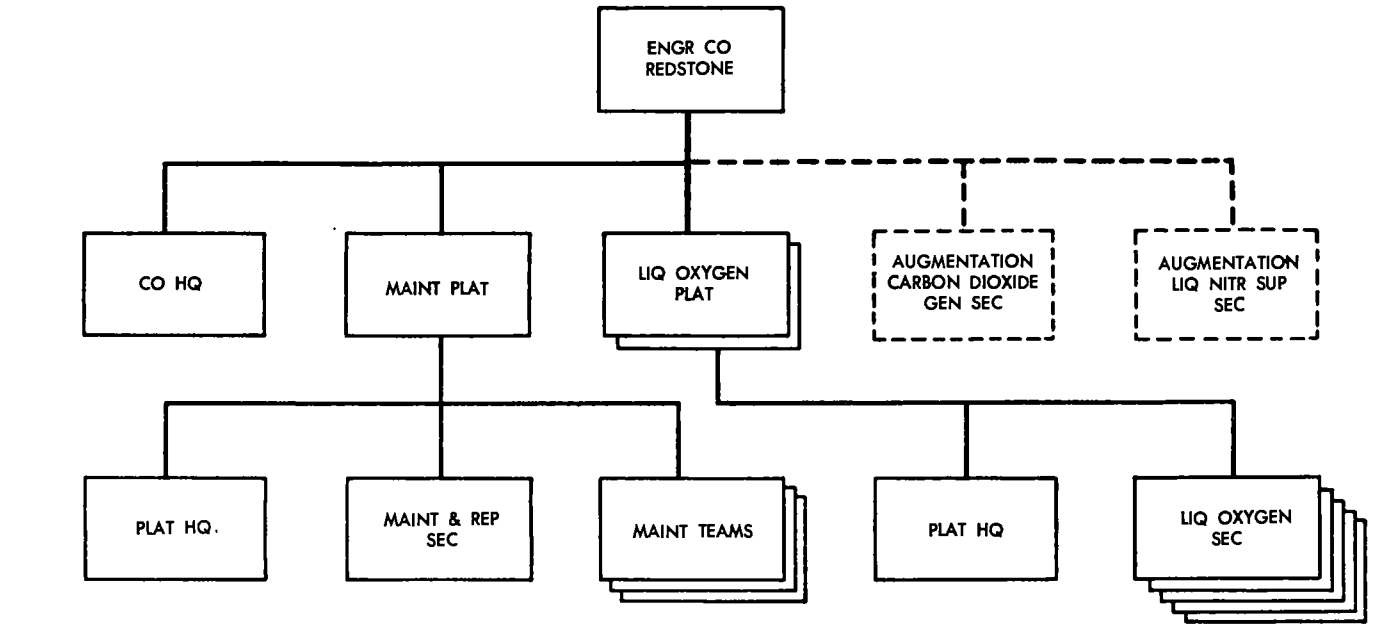
f. Individuals of this unit can engage in combat missions required. It has the capability of defending itself and its installations against hostile ground attack.

4. **Basis of Allocation.** One per Field Artillery Missile Group (Heavy), TOE 6–610, or one per Field Artillery Missile Group, REDSTONE, TOE 6–630.

5. **Category.** II.

6. **Mobility.** One hundred percent.

Section B. ORGANIZATION (fig. 39)



STRENGTH OFF 4 WO 3 EM 184 AGG 191

TOE 5-214D

Figure 39. Organizational Chart Engineer Company, REDSTONE.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons

Gun, machine 7.62 mm lw	7
Launcher rocker 3.5-inch	4

Vehicles

Truck utility ¼-T	1
Truck cargo ¾-T	6
Truck cargo 2½-T	7
Truck tractor 5-T	44
Truck wrecker 5-T	1
Semitrailer tank gasoline 5000 gal	6

Engineer Equipment

Cleaner steam whl mtd 100 psi	1
Converter liquid oxygen 1200 cu ft	1
Crane-shovel trk mtd 20-T ¾ cu yd	1
Generating and charging plant semitrailer mtd 200 lb. nitrog 5-T oxy per day.	10
Indicator dew point CO_2 type 0 to 50° F	1
Semitrailer repair parts 6-T	3
Shop contact maintenance trk mtd	3
Shop electrical repair semitrlr mtd	1
Shop general purpose semitrlr mtd	1
Tank storage liquid oxygen ¾-T	2
Tank storage liquid oxygen semitrlr mtd 9–T	13
Tractor whl 20025 to 27000 DBP	2

Signal

Detector set AN/PRS–3	1
Radio set AN/GRR–5	1
Radio set AN/VRC–9	3
Radio set AN/VRC–17	1
Radio set AN/GRC–46	1

TOE 5–225D
AIRBORNE DIVISION ENGINEER BATTALION

Section A. GENERAL

1. Mission. *a.* To increase the combat effectiveness of the Airborne Division by combat support and general engineer work.

b. To undertake and carry out airborne infantry combat mission when required.

2. Assignment. To Airborne Division, TOE 57.

3. Capabilities. *a.* Providing engineer staff planning and supervision, including that required for attached troops.

b. Providing engineer reconnaissance and intelligence.

c. Facilitating the movement of the division by providing roads, bridges, fords and culverts and by bridging obstacles.

d. Assisting in the construction and repair of command posts, shelters and defensive installations.

e. Providing air-landing facilities for assault aircraft as required.

f. Preparing and executing demolitions, including employment of ADM.

g. Providing personnel and equipment for purification and supply of water.

h. Being landed by parachute and aircraft.

i. Providing personnel and equipment for rapid stream crossings, to include assault boats and three 38-foot short spans of aluminum deck balk bridging.

j. Providing map supply services.

k. Providing technical assistance in special camouflage.

l. Assisting with the emplacement of obstacles, including mines and boobytraps.

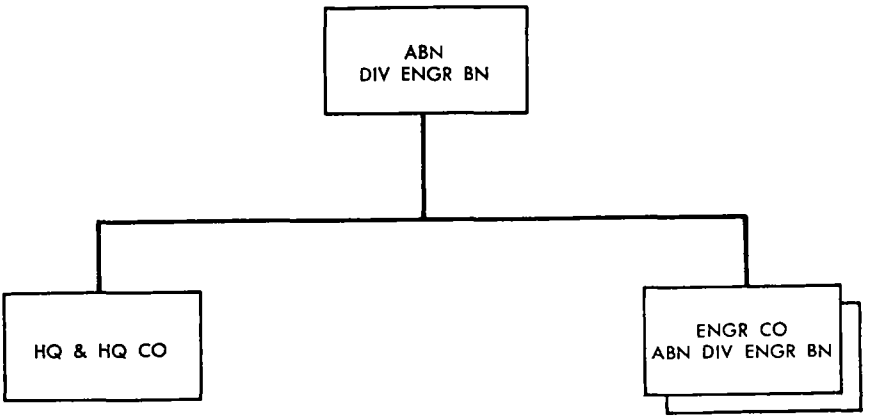
m. Providing engineer support to the division and its elements.

4. Basis of Allocation. One per Airborne Division, TOE 57.

5. Category. I.

6. Mobility. Thirty-five percent.

Section B. ORGANIZATION (fig. 40)



STRENGTH OFF 31 WO 2 EM 440 AGG 473

TOE 5-225D

Figure 40. Organizational Chart Airborne Division Engineer Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

	AGG Breakdown Within Organic Units		
	5-225D	*5-226D*	*5-227D*
Weapons			
Gun machine 7.62 mm lw	30	12	9
Launcher rocket 3.5-inch	12	2	5
Vehicles			
Carrier light weapons ½-T	25	1	12
Truck ambulance ¼-T	1	1	
Truck utility ¼-T	20	10	5
Truck cargo ¾-T	23	5	9
Truck cargo 2½-T	4	2	1
Truck dump 2½-T	12	8	2
Engineer Equipment			
Boat landing assault	10	10	
Boat recon 3-man	6	6	
Bridge fixed highway 38 ft span	3	3	
Crane shovel airborne 7½-T ½ cu yd	2	2	
Drafting equip set bn	3	3	
Grader road mtzd 10 ft blade	6	6	
Loader scoop 4 whl 1½ cu yd	6	6	
Pneu tool and compressor outfit 210 cfm trlr mtd	3	1	1
Reproduction set gelatin process	1	1	
Survey set general purpose	1	1	
Test set soil	1	1	

	AGG Breakdown Within Organic Units		
	5-225D	5-226D	5-227D
Tool outfit pioneer port elec tools	8		4
Tractor full-trckd air-transportable w/bulldozer scarif.	6	6	
Water purification set trlr mtd 600 gph	4	4	
Signal			
Camera KS–4	1	1	
Detector AN/PRS–3	28	4	12
Radio set AN/GRC–65	1	1	
Radio set AN/GRR–5	1	1	
Radio set AN/PRC–10	36	4	16
Radio set AN/VRC–10	17	7	5
Radio set AN/VRC–18	1	1	
Radio set AN/VRC–34	3	1	1
Radio set AN/VRQ–3	3	1	1
Photographic set ES–12	1	1	

TOE 5–226D
HEADQUARTERS AND HEADQUARTERS COMPANY AIRBORNE DIVISION ENGINEER BATTALION

Section A. GENERAL

1. Mission. *a.* To provide engineer special staff assistance to the division, and command and staff, communications, reconnaissance, administration, supply and heavy equipment for the Airborne Division Engineer Battalion.

b. To undertake and carry out airborne infantry combat missions when required.

2. Assignment. Organic to Airborne Division Engineer Battalion, TOE 5–225D.

3. Capabilities. *a.* Performing staff planning and supervision of engineer operations within the division, including that required for the operations of attached troops.

b. Performing engineer reconnaissance and intelligence functions.

c. Providing map supply and four water points.

d. Providing heavy equipment, 10 assault boats, and three short span fixed bridges, each approximately 38 feet in length.

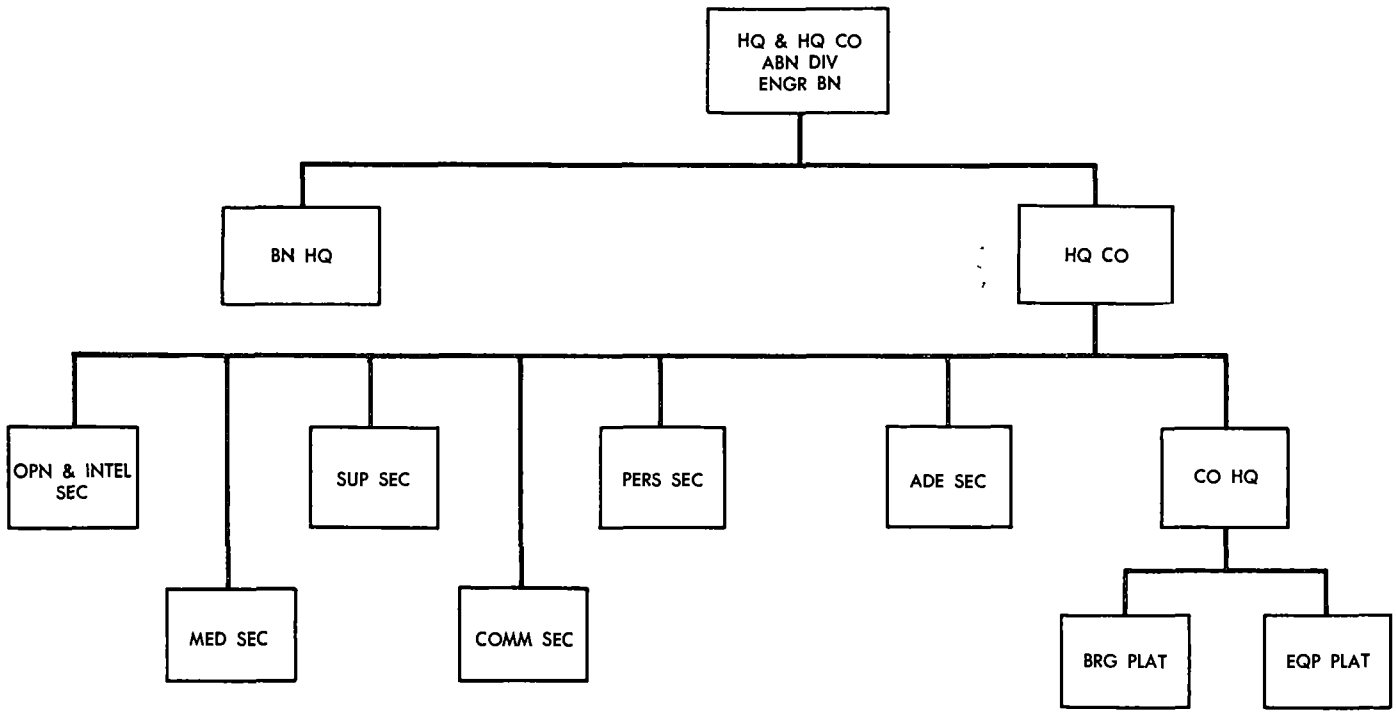
e. Providing unit level medical service to include medical care and evacuation for the Airborne Division Engineer Battalion, establishing an aid station, and furnishing aidmen to battalion units.

4. Basis of Allocation. One per Airborne Division Engineer Battalion, TOE 5–225D.

5. Category. I.

6. Mobility. Forty percent.

Section B. ORGANIZATION (fig. 41)



STRENGTH OFF 19 WO 2 EM 134 AGG 155

TOE 5-226D

Figure 41. Organizational Chart Headquarters and Headquarters Company, Airborne Division Engineer Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–225D.)

TOE 5–227D

ENGINEER COMPANY, AIRBORNE DIVISION ENGINEER BATTALION

Section A. GENERAL

1. Mission. *a.* To provide air-landing facilities for assault aircraft and general work for the Airborne Division.

b. To engage in infantry-type combat when required.

2. Assignment. Organic to the Airborne Division Engineer Battalion, TOE 5–225D.

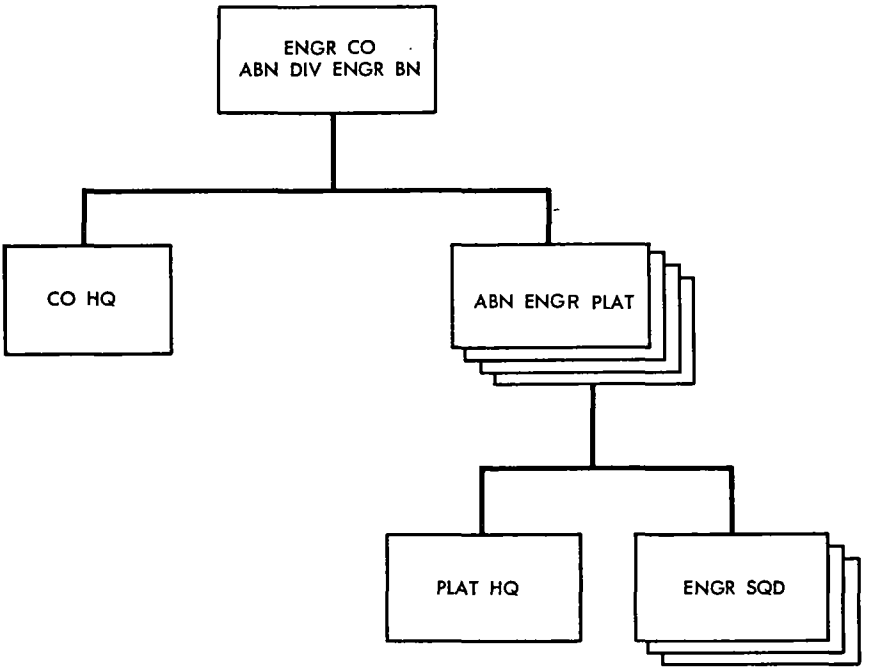
3. Capabilities. Performing combat engineer tasks in a detached, direct support, or general support role.

4. Basis of Allocation. Two per Airborne Division Engineer Battalion, TOE 5–225D.

5. Category. I.

6. Mobility. Thirty percent.

Section B. ORGANIZATION (fig. 42)



STRENGTH OFF 6 EM 153 AGG 159
TOE 5-227D

Figure 42. Organizational Chart Engineer Company Airborne Division, Engineer Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(*See* Section C, TOE 5–225D.)

TOE 5–237D

ENGINEER MAINTENANCE COMPANY DIRECT SUPPORT

Section A. GENERAL

1. **Mission.** To provide third echelon maintenance support of engineer equipment in supported units and to furnish repair parts as required.

2. **Assignment.** To the Field Army or communications zone. Normally attached to Headquarters and Headquarters Company, Engineer Maintenance and Supply Group, TOE 5–262.

3. **Capabilities.** This unit has the following capabilities:

a. Provides third echelon maintenance support for approximately 2000 major items of engineer equipment, performs third and limited fourth echelon maintenance on 1500 items of engineer equipment when deployed in a static condition, including such equipment as 1½ k.w. generators and larger items.

b. Performs evacuation of disabled equipment to rear area maintenance units when repair cannot be accomplished by this company. Performs limited evacuation from using units to the company maintenance sites as dictated by operational situation.

c. Provides engineer repair parts in support of maintenance activities of the company and supported units.

d. Provides technically qualified personnel for inspecting, advising and instructing using organizations in equipment maintenance practices and procedures.

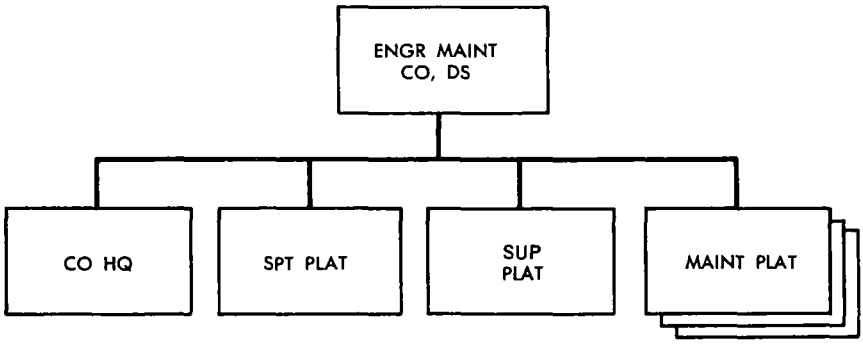
e. Individuals of this unit can engage in combat missions when required. It has the capability of defending itself and its installations against hostile ground attack.

4. **Basis of Allocation.** Six per type field army.

5. **Category.** II.

6. **Mobility.** Ninety percent.

Section B. ORGANIZATION (fig. 43)



STRENGTH OFF 5 WO 5 EM 185 AGG 195

TOE 5-237D

Figure 43. Organizational Chart Engineer Maintenance Company, Direct Support.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons

Gun machine 7.62 mm lw	9
Launcher rocket 3.5 inch	1

Vehicles

Truck utility ¼-T	4
Truck cargo ¾-T	7
Truck cargo 2½-T	8
Truck tractor 5-T	13
Truck wrecker 5-T	3
Truck tractor 10-T	4

Engineer Equipment

Crane-shovel trk mtd 20-T ¾ cu yd	1
Lubricating and servicing unit trlr mtd	1
Shop elect repair semitrlr mtd	1
Shop general purpose semitrlr mtd	1
Shop contact maint trk mtd	6
Shop organzl repair trk mtd	3
Shop welding trlr mtd	2
Semitrlr repair parts van 6-T	8

Semitrlr low-bed 25-T 4 whl	4
Semitrlr van cargo 12-T	3
Steam cleaner trlr mtd	1
Supplement equip maint co	1

Signal

Radio set AN/GRC–19	1
Radio set AN/GRR–5	1
Radio set AN/VRC–34	4
Receiver Radio R–392	1
Teletypewriter set AN/PGC–1	1

TOE 5–262R

HEADQUARTERS AND HEADQUARTERS COMPANY ENGINEER MAINTENANCE AND SUPPLY GROUP

Section A. GENERAL

1. Mission. To provide an administrative and command headquarters to supervise the operations of a flexible group composed of engineer maintenance and supply personnel and non-engineer service units engaged in receipt, storage, and issue of engineer supplies and equipment, and maintenance, evacuation, reclamation and salvage of engineer equipment.

2. Assignment. To field army or communications zone.

3. Capabilities. *a.* Command a group composed of three to seven battalions of engineer maintenance and supply units, or equivalents.

b. Hire, administer, supervise, and control up to 5,000 indigenous laborers or prisoners of war.

c. Plan, coordinate, inspect, and supervise group operations, to include: selecting sites for engineer and supply installations; coordinating the transportation activities of the group; analyzing the demands for labor, warehousing, and equipment and repair facilities, and seeing that they are met; and coordinating engineer evacuations, reclamations, and salvage activities.

d. Assist higher headquarters in supply and maintenance planning to meet operational requirements.

e. Perform fiscal and procurement activities in connection with group operations.

f. Implement the policies and procedures prescribed by higher authority with respect to: stock control of engineer general supplies, equipment and repair parts, as determined by operational demands; critical item lists, stock availability; and the stock status reports of subordinate agencies thereon; and the replacement of equipment, taking into account repair capabilities and requirements.

g. Prepare and submit replenishment requisition for critical item and stock shortages.

h. Maintain statistical control of the group's supply and maintenance activities by consolidating and analyzing data thereon.

i. Maintain a record and reporting system pertaining to engineer supplies, equipment, and maintenance work within the group.

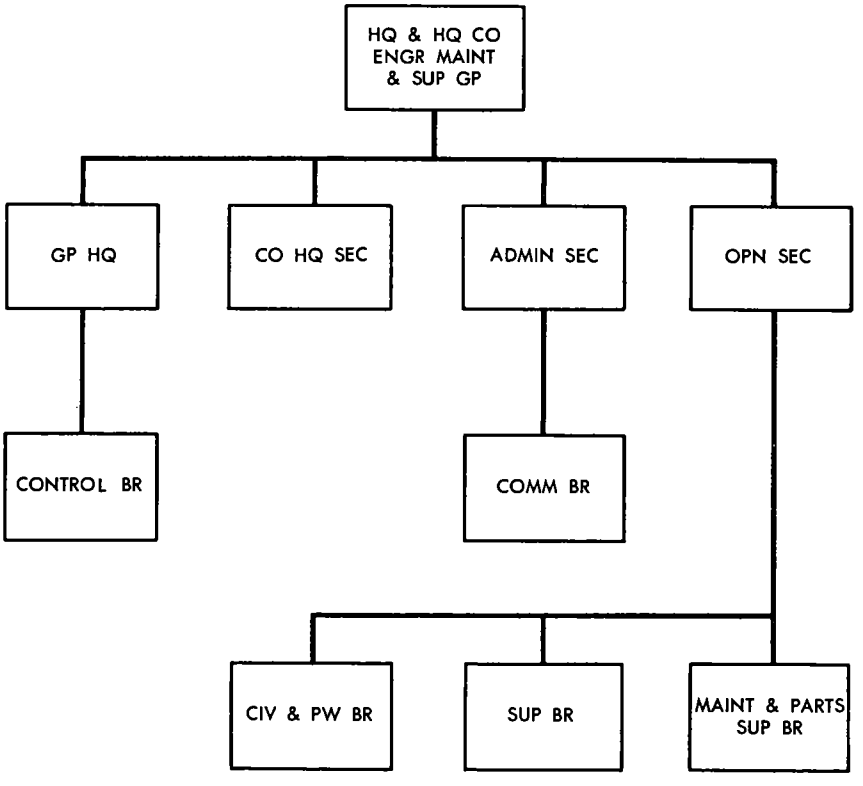
j. Supervise unit administration within subordinate units, and give administrative assistance to any such units which are not part of a battalion.

4. **Basis of Allocation.** One per three to seven battalions or approximate equivalent.

5. **Category.** III.

6. **Mobility.** Fifty percent.

Section B. ORGANIZATION (fig. 44)



STRENGTH OFF 15 WO 8 EM 108 AGG 131

TOE 5-262R

Figure 44. Organizational Chart Headquarters and Headquarters Company, Engineer Maintenance and Supply Group.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Automobile sedan	2
Truck pickup ½-T	11
Truck utility ¼-T	6
Truck stake 5-T	3

Engineer Equipment

Reproduction set ammonia process	1

TOE 5–266D
HEADQUARTERS AND HEADQUARTERS DETACHMENT, ENGINEER DEPOT BATTALION

Section A. GENERAL

1. Mission. To provide an administrative and command headquarters to supervise the operations of a flexible battalion composed of engineer units engaged in receipt, storage, and issue of engineer supplies and equipment in a field army or communications zone.

2. Assignment. To a communications zone; may be attached to an engineer maintenance and supply group.

3. Capabilities. *a.* This unit is capable of supervising the operations of two or more depot companies, four or more engineer equipment supply teams, other attached equipment supply teams in TOE 5–500, and attached labor service companies in a communications zone by providing the following:

(1) Planning of training and operations; and allotment of tasks, equipment, and facilities to subordinate units.

(2) Supervision, coordination, and inspection of supply administration and supply operations of assigned or attached units.

(3) Determination of transportation requirements, and coordination of shipping and transportation facilities.

(4) Provision of battalion supply and operation of unit vehicles for the battalion.

b. This unit will be dependent upon one of its attached companies for messing and automotive maintenance.

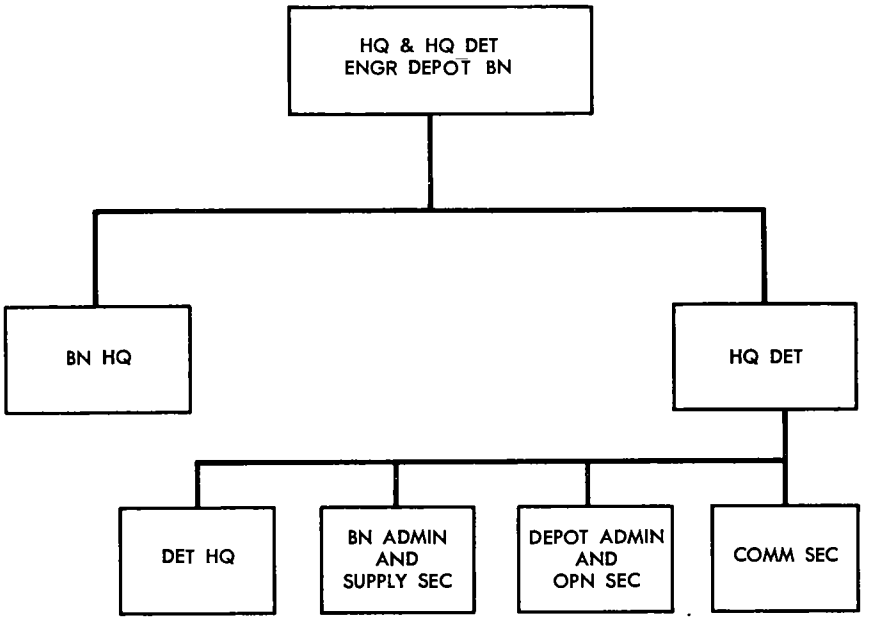
c. The unit has the capability of defending itself and its installation against hostile ground attack.

4. Basis of Allocation. One per two to four engineer supply or service units.

5. Category. III.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 45)



STRENGTH OFF 5 WO 3 EM 38 AGG 46

TOE 5-266D

Figure 45. Organizational Chart Headquarters and Headquarters Detachment, Engineer Depot Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Automobile sedan	1
Truck utility ¼-T	2
Truck cargo ¾-T	4
Truck cargo 2½-T	3

Engineer Equipment

Drafting equip. set Co.	1
Reproduction set black-white process No. 2	1
Reproduction set spirit process No. 6	1

Signal

Teletypewriter set AN/PGC–1	1

TOE 5–267D

ENGINEER DEPOT COMPANY

Section A. GENERAL

1. Mission. To operate an engineer depot for the receipt, storage, and issue of engineer general supplies and equipment.

2. Assignment. To communications zone. Normally attached to an engineer depot battalion or an engineer maintenance and supply group, or may operate as a separate company.

3. Capabilities. When labor personnel are furnished by TOE 10–67C, or other labor sources, depending on workloads imposed by varying stock levels, this unit is capable of—

a. Receipt, storage, and issue of engineer general supplies and equipment in depot operations in support of a field army, an air force or a communications zone installation.

b. Maintenance of stock records, locator systems, bin identification system, voucher registers, and other necessary stock accounting records.

c. Preparation of stock status reports, tonnage reports, and other special reports as required or directed.

d. Preparation of replenishment requisitions to maintain established stock levels.

e. Establishment and adjustment of stock levels under battalion or group supervision.

f. Provision of unit personnel administration, mess, supply, and maintenance for headquarters and headquarters detachment, engineer depot battalion, when attached.

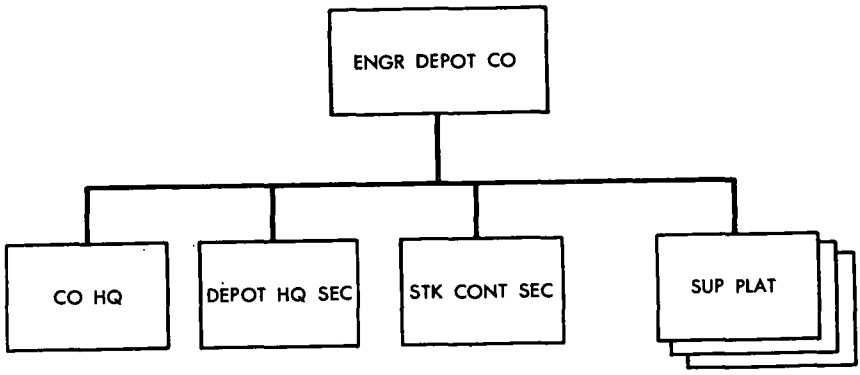
g. Individuals of this unit can fight as infantrymen when required. This unit has the capability of defending itself and its installations against hostile ground attack.

4. Basis of Allocation. One per maintenance and supply group, in army areas; two per headquarters and headquarters detachment, engineer depot battalion, in communications zone.

5. Category. III.

6. Mobility. Thirty-five percent.

Section B. ORGANIZATION (fig. 46)



STRENGTH OFF 4 WO 2 EM 195 AGG 201

TOE 5-267D

Figure 46. Organizational Chart Engineer Depot Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck utility ¼-T	1
Truck cargo ¾-T	4
Truck cargo 2½-T	1
Truck cargo 5-T	5
Truck tractor 5-T	3

Engineer Equipment

Crane-shovel trk mtd 20-T ¾-cu yd	6
Drafting and duplicating equip set No. 1	1
Supplementary equip set No. 17 depot	1

Signal

Teletypewriter set AN/PGC–1	1

TOE 5–278E
ENGINEER HEAVY MAINTENANCE COMPANY

Section A. GENERAL

1. Mission. To perform fourth echelon maintenance of engineer equipment and overhaul of certain components (assemblies and subassemblies) of end items, and certain engineer mechanical equipment as designated by the Department of the Army, and, in support of Engineer Direct Support Maintenance Companies, to perform overflow third echelon maintenance.

2. Assignments. To a field army or communications zone. Normally attached to an engineer maintenance and supply group.

3. Capabilities. This unit has the following capabilities:

a. Providing direct support to three Engineer Direct Support Maintenance Companies when work is beyond the technical or physical capabilities of the companies by providing the following services:

(1) Repairing of engineer equipment requiring fourth echelon and overflow third echelon maintenance and overhaul of parts, subassemblies, assemblies, and certain other engineer equipment.

(2) Repairing and classifying exchanged repairable parts and assemblies for use in the company maintenance operations and return to parts depot stock.

(3) Serviceability testing, classifying and repairing engineer equipment in or to be returned to depot stock or to be otherwise disposed of.

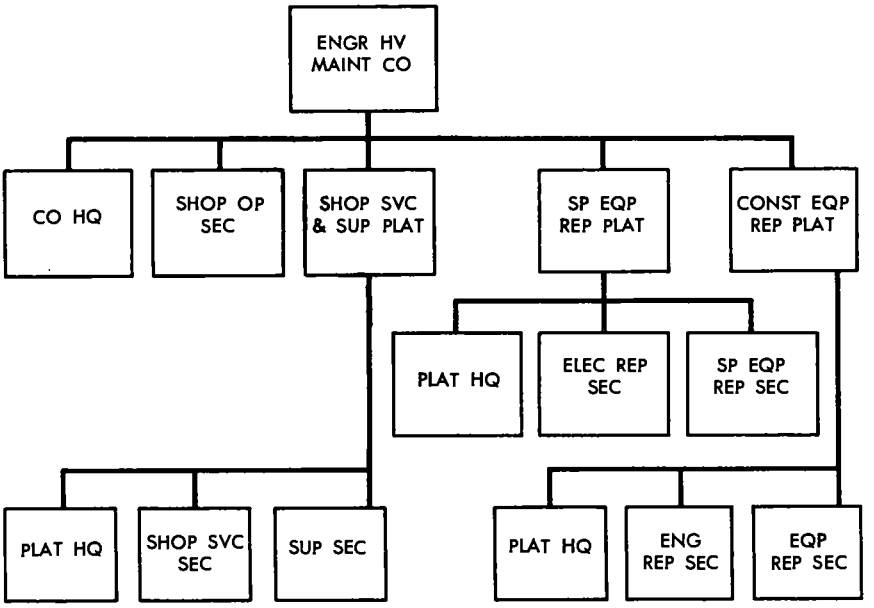
b. Individuals of this unit can fight as infantrymen when required. This unit has a limited capability of defending itself and its installations against hostile ground attack.

4. Basis of Allocation. One per three Engineer Maintenance Companies, (Direct Support), TOE 5–237.

5. Category. III.

6. Mobility. Fifty percent.

Section B. ORGANIZATION (fig. 47)



STRENGTH OFF 4 WO 5 EM 190 AGG 199

TOE 5-278E

Figure 47. Organizational Chart Engineer Heavy Maintenance Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck utility ¼-T	2
Truck cargo ¾-T	1
Truck cargo 2½-T	5
Truck cargo 5-T	2
Truck wrecker 5-T	2
Truck tractor 10-T	1
Truck tractor 5-T	3

Engineer Equipment

Compressor skd mtd 100 psi	3
Crane shovel trk mtd 20-T ¾ cu yd	1
Crane whse mob 5-T	1
Drilling machine radial 5-hp	1
Equipment repair set sniperscope	2
Generator skd mtd 5-kw	2
Generator skd mtd 10-kw	1
Generator skd mtd 60-kw	1
Lathe engine 5-hp	1
Lubricating and servicing unit trlr mtd	2

Metallizing outfit, base maint	1
Milling machine 5-hp	1
Shaper metal cutting 10-hp	1
Semitrailer low bed 25-T	1
Semitrailer, repair parts van 6-T	4
Shop equip organzl rep trk mtd	1
Shop equip gen purp rep semitrlr mtd	3
Shop equip int combust rep	1
Shop equip woodwork base maint trlr mtd	1
Steam cleaner 50–125 psi	2
Supplementary equip hvy shop co	1
Trailer low bed 60-T	1
Tool kit light mach rep	2
Tool kit precis inst rep	2
Tool kit refrig unit	5

Signal

Radio set AN/VRC–34	1
Radio set AN/GRC–19	1
Radio Set AN/GRR–5	1
Radio receiver R–392/URR	1

TOE 5–279D

ENGINEER PARTS DEPOT COMPANY

Section A. GENERAL

1. Mission. To operate a spare parts depot to support the maintenance of engineer equipment by receiving, storing, issuing, and shipping engineer repair parts.

2. Assignment. Field army or communications zone. Normally attached to an Engineer Maintenance and Supply Group, TOE 5–262.

3. Capabilities. *a.* At full strength this unit provides engineer equipment spare parts support as follows:

(1) In the field army for from four to six Engineer Maintenance Companies, Direct Support, TOE 5–237D.

(2) In the communications zone for three Engineer Maintenance Companies, Direct Support, plus one Engineer Heavy Maintenance Company.

(3) Support approximately 9,000 items of engineer equipment, and handle approximately 1,000 tons of spare parts per month.

b. Bulk replenishment parts support for the engineer direct support maintenance companies and other units authorized to stock and distribute parts to engineer equipment users.

c. Retail parts support for engineer depot maintenance companies and other designated units which are not directly supported by the engineer direct support maintenance companies.

d. Depot stock control and supply control functions for engineer spare parts.

e. Inspection of parts stock levels of supported units to insure the maintenance of realistic stock levels.

f. Maintains repair parts consumption-demand dates, accumulates actual or anticipated engineer equipment density in the area to be supported and other pertinent operations data.

g. Organizational maintenance for organic equipment.

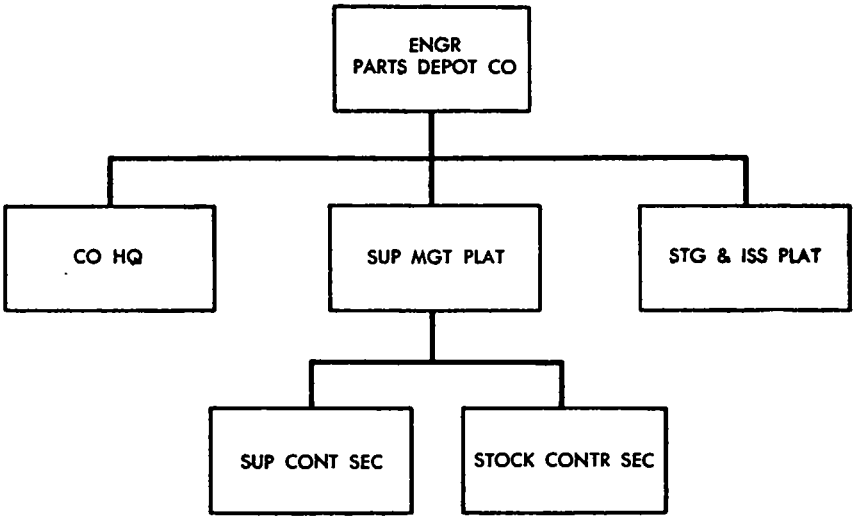
h. Individuals of this unit can fight as infantrymen when required. The unit has the capability of defending itself and its installations against hostile ground attack.

4. Basis of Allocation. One per Engineer Maintenance and Supply Group, TOE 5–262.

5. Category. III.

6. Mobility. Twenty percent.

Section B. ORGANIZATION (fig. 48)



STRENGTH OFF 4 WO 2 EM 172 AGG 178

TOE 5-279D

Figure 48. Organizational Chart Engineer Parts Depot Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck utility ¼-T	1
Truck cargo ¾-T	2
Truck cargo 2½-T	2
Truck cargo 5-T	4
Truck tractor 10-T	1

Engineer Equipment

Cleaner steam whl mtd 100-psi	1
Crane-shovel trk mtd 10-T ½ cu yd	1
Crane-shovel trk mtd 20-T ¾ cu yd	1
Drafting and duplicating set No. 1	1
Generator skd mtd 15-kw	1
Supplementary equip set No. 17 depot	1
Tractor whl 3725–5175 DBP	2
Truck fork	4
Tractor whse 2-T	8
Trailer whse 2-T	60
Trailer low bed 8-T	8

Signal

Teletypewriter set AN/PGC–1	1

TOE 5–344R

ENGINEER BASE MAP DEPOT COMPANY

Section A. GENERAL

1. Mission. To provide facilities for storage of maps and related materials used by field armies.

2. Assignment. Assigned or attached to an engineer base topographic battalion.

3. Capabilities. *a.* Providing map stockage sufficient for one army group.

b. Handling 5,000,000 maps per month.

c. Receiving, classifying, and storing maps and related materials.

d. Packaging and preparing maps and related materials for shipment to forward depots.

e. Operating three forward communications zone depots.

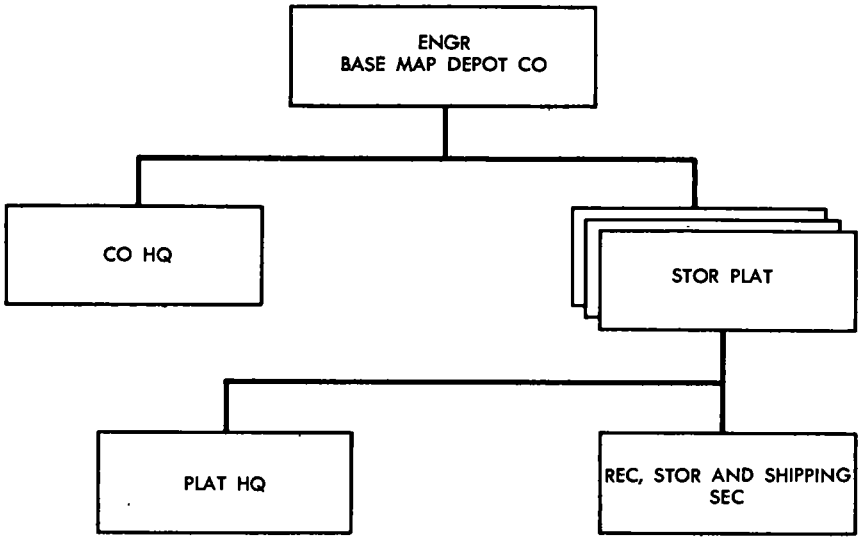
f. Individuals of this unit can fight as infantrymen when required. This unit has the capability of defending itself and its installations against hostile ground attack.

4. Basis of Allocation. One per Army Group or Independent Field Army.

5. Category. III.

6. Mobility. Sixty percent.

Section B. ORGANIZATION (fig. 49)



STRENGTH OFF 2 WO 3 EM 129 AGG 134

TOE 5-344D

Figure 49. Organizational Chart Engineer Base Map Depot Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck utility ¼-T	1
Truck cargo ¾-T	4
Truck cargo 2½-T	5

Engineer Equipment

Map distribution set depot	1
Map distribution set PTBL	3
Truck fork lift	6

TOE 5–346D
HEADQUARTERS AND HEADQUARTERS DETACHMENT, ENGINEER BASE TOPOGRAPHIC BATTALION

Section A. GENERAL

1. Mission. Planning and technical control of a flexible battalion engaged in the compilation, reproduction, and distribution of military maps.

2. Assignment. Normally assigned to communications zone or zone of interior.

3. Capabilities. This unit is capable of providing—

a. Administrative, operational and technical planning, supervision and control of two to five engineer companies, in any combination of the following units: Engineer Base Map Depot Company, Engineer Base Map Reproduction Company, Engineer Base Survey Company, Engineer Base Photomapping Company, and/or Topographic or intelligence teams.

b. Limited distribution of emergency map supply to combat and combat support units.

c. This unit is dependent upon other units for mess.

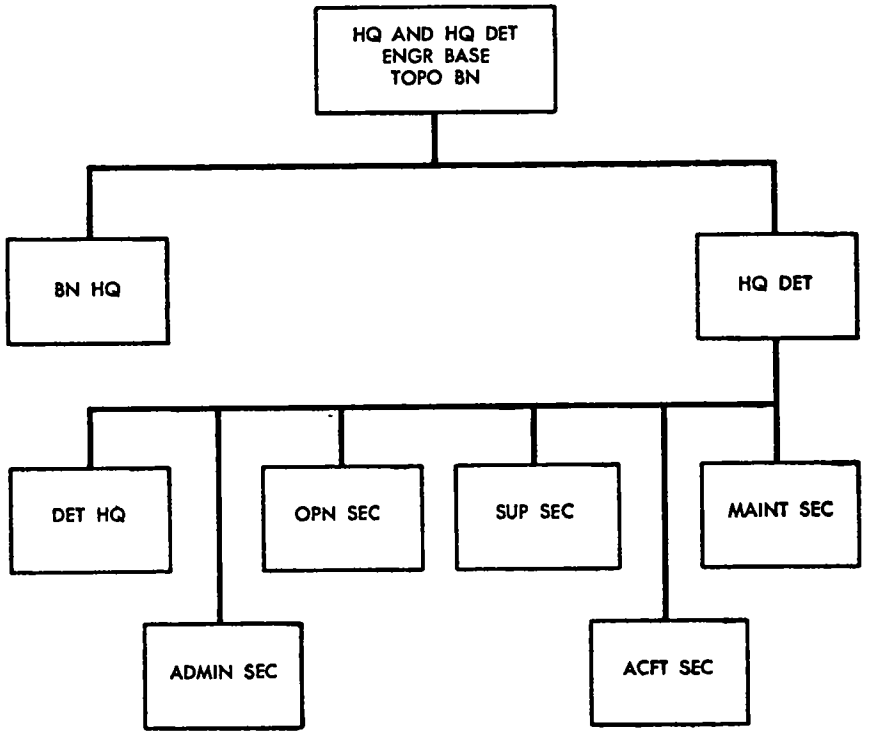
d. Individuals of this unit can fight as infantrymen when required. This unit has the capability of defending itself and its installation against hostile ground attack.

4. Basis of Allocation. One per theater of operations.

5. Category. III.

6. Mobility. Seventy percent.

Section B. ORGANIZATION (fig. 50)



STRENGTH OFF 6 WO 3 EM 49 AGG 58

TOE 5-346D

Figure 50. Organizational Chart Headquarters and Headquarters Detachment, Base Topographic Battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck cargo 5-T	1
Truck utility ¼-T	1
Truck cargo ¾-T	4
Truck cargo 2½-T	4
Truck tank gasoline 2½-T	1

Engineer Equipment

Drafting equip set topo bn	1
Reproduction set spirit process	1

Signal

Radio set AN/PRC–10	1
Radio set AN/URC–4	2

Aircraft

Airplane utility	1
Helicopter recon	1

TOE 5–347D

ENGINEER BASE REPRODUCTION COMPANY

Section A. GENERAL

1. Mission. To reproduce maps, charts, and allied mapping materials, such as map indexes, trigonometric lists, and gazetters, as required.

2. Assignment. To communications zone or zone of the interior Normally attached to Headquarters and Headquarters Detachment, Engineer Base Topographic Battalion, TOE 5–346.

3. Capabilities. *a.* Providing reproduction capability to one or more field armies in a theater of operations, in a communications zone, or in the zone of interior.

b. Reproducing in quantity maps, charts, and overlays, as required, in black and white or multicolor. Maximum size of sheet 35 by 45 inches.

c. Reproducing 4,000,000 impressions per month, based on orders averaging 20,000 copies of 1 color per run, working two shifts per day.

d. Performing organizational maintenance on all mechanical equipment and third echelon maintenance on engineer photographic and reproduction equipment.

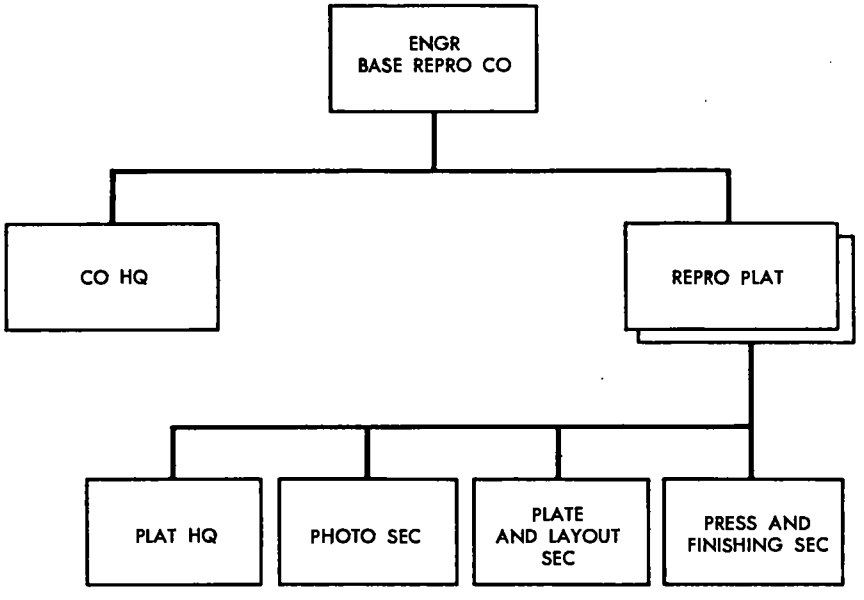
e. Individuals of this unit can fight as infantrymen when required. This unit has capability of defending itself and its installation against hostile ground attack.

4. Basis of Allocation. Normally one per engineer base topographic battalion.

5. Category. III.

6. Mobility. Fixed.

Section B. ORGANIZATION (fig. 51)



STRENGTH OFF 2 WO 3 EM 118 AGG 123

TOE 5-347D

Figure 51. Organizational Chart Engineer Base Reproduction Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck, cargo ¾-T	1
Truck, cargo 2½-T	1
Truck, cargo 5-T	1

Engineer Items

Generator, skid mtd, 60 kw	4
Reproduction set topo photolitho	1
Truck, forklift	1

TOE 5–348D

ENGINEER BASE SURVEY COMPANY

Section A. GENERAL

1. **Mission.** To perform field surveys and computations necessary to establish original, or to recover existing, geodetic position control for new mapping and or map revision; to provide position and azimuth control for the surveying elements of the Engineer Topographic Battalion, Army.

2. **Assignment.** To communications zone or zone of the interior, normally assigned or attached to Headquarters and Headquarters Detachment Engineer Base Topographic Battalion, TOE 5–346.

3. **Capabilities.** *a.* Providing organic topographic surveying to one or more field armies in a theater of operations, to a communications zone, or to the zone of the interior.

b. Performing geodetic survey of second and third order precision, including leveling and establishment of base lines.

c. Performing topographic surveys using conventional field methods.

d. Providing necessary control data for the compilation of new or the revision of existing topographic maps by stereophotogrammetric methods.

e. Operating as a separate company.

f. Accomplishing the following per month by each of the survey sections: Second Order Survey; Sixty (60) miles of traverse, one hundred thirty (130) miles of level, establish forty (40) triangulation stations; Third Order Survey; seventy (70) miles of traverse, one hundred sixty (160) miles of level, establish forty-eight (48) triangulation stations.

g. Completing final office computations.

h. Performing organizational maintenance on all vehicles and equipment authorized and third echelon maintenance on surveying equipment.

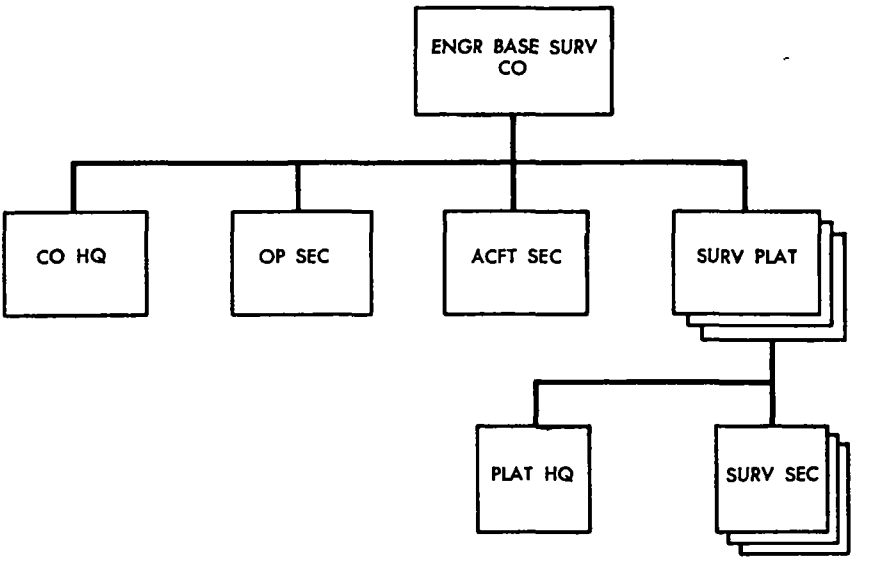
i. Individuals of this unit can fight as infantrymen when required. This unit has the capability of defending itself and its installation against hostile ground attack.

4. **Basis of Allocation.** One per base topographic battalion.

5. **Category.** III.

6. **Mobility.** Eighty percent.

Section B. ORGANIZATION (fig. 52)



STRENGTH OFF 6 WO 4 EM 155 AGG 165

TOE 5-348D

Figure 52. Organizational Chart Engineer Base Survey Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck, cargo ¾-T	7
Truck, cargo 2½-T	23
Truck, tank gasoline 2½-T	1
Truck, cargo 5-T	1

Engineer Equipment

Computing and drafting equip set	1
Generator, skid mtd, 5 KW	1
Survey set, plane table 5 man	3
Survey set, precise baseline first order accuracy	1
Survey set, precise traverse	9
Survey set triang principal Obs and Sig tender	9
Survey set, astronomic	3
Survey set, supplement equip	9
Tower erection set topo	6
Trailer bolster 2½-T	12
Transit 1 min	3

Signal

Radio set AN/GRC–87	3
Radio set AN/PRC–10	1
Radio set AN/VRC–4	4

Radio set AN/VRC–8	18
Receiving set radio AN/TRR–8	3
Aircraft	
Airplane, utility	1
Helicopter, recon	3

TOE 5–349D

ENGINEER BASE PHOTOMAPPING COMPANY

Section A. GENERAL

1. Mission. To provide new and revised map manuscript for the reproduction of multicolored maps.

2. Assignment. To communications zone or zone of interior. Normally attached to Headquarters and Headquarters Detachment, Engineer Base Topographic Battalion, TOE 5–346.

3. Capabilities. This unit is designed and equipped to—

a. Compile new maps from aerial photography using stereophotogrammetric instruments.

b. Prepare controlled mosaics of aerial photographs.

c. Accomplish color separation drafting of all map compilations.

d. Perform organizational maintenance on all vehicles and equipment authorized and third echelon maintenance on photomapping equipment.

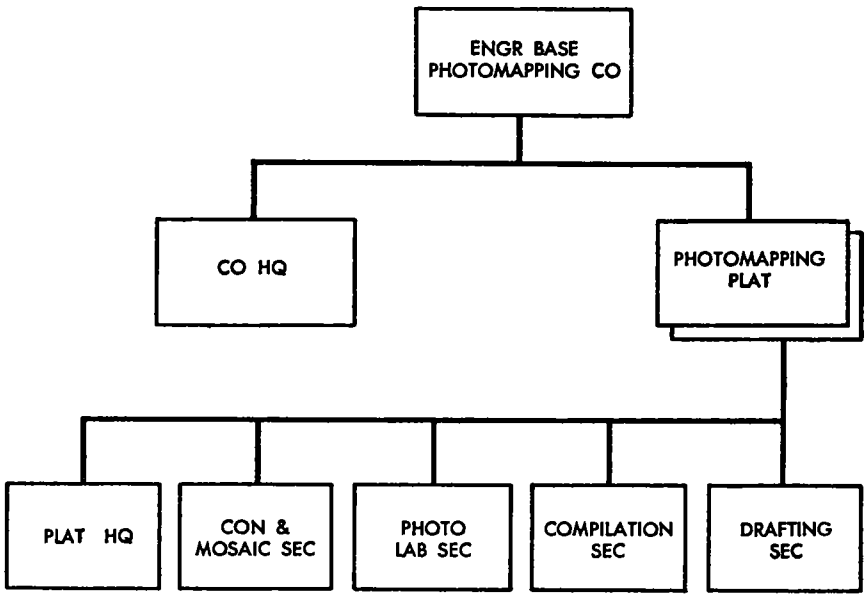
e. Individuals of this unit can fight as infantrymen when required. This unit has the capability of defending itself and its installation against hostile ground attack.

4. Basis of Allocation. One per Engineer Base Topographic Battalion.

5. Category. III.

6. Mobility. Fixed.

Section B. ORGANIZATION (fig. 53)



STRENGTH OFF 4 WO 3 EM 177 AGG 184

TOE 5-349D

Figure 53. Organizational Chart Engineer Base Photomapping Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck, cargo ¾-T	1
Truck, cargo 2½-T	1
Truck, cargo 5-T	1

Engineer Equipment

Drafting equip set topo bn photo map co	1
Drafting equip set supplementary	40
Plotting inst set stereoplot multiplex plot booth	20
Plotting inst rep set stereoplot proj minor mech rep	1
Plotting inst rep set stereoplot proj supplement	1
Plotting inst set stereoplot multiplex control booth	4
Plotting inst set stereoplot multiplex draft unit	26
Plotting inst set stereoplot multiplex lab	1
Reproduction set ammonia process	1
Tool kit, precis inst rep	1

Signal

Photographic equip PH–383	1

TOE 5–387D

ENGINEER FORESTRY COMPANY

Section A. GENERAL

1. Mission. To operate a lumber yard and to conduct logging and sawing operations for production of rough lumber, timbers and piling.

2. Assignment. Normally assigned to communications zone; or assigned or attached to an engineer maintenance and supply group.

3. Capabilities. This unit has the following capabilities:

a. Operating a lumberyard to include grading, classifying, stacking, and issuing of lumber and maintaining records of stock on hand.

b. Producing 10,000 to 15,000 board feet per day of rough lumber and timbers per platoon.

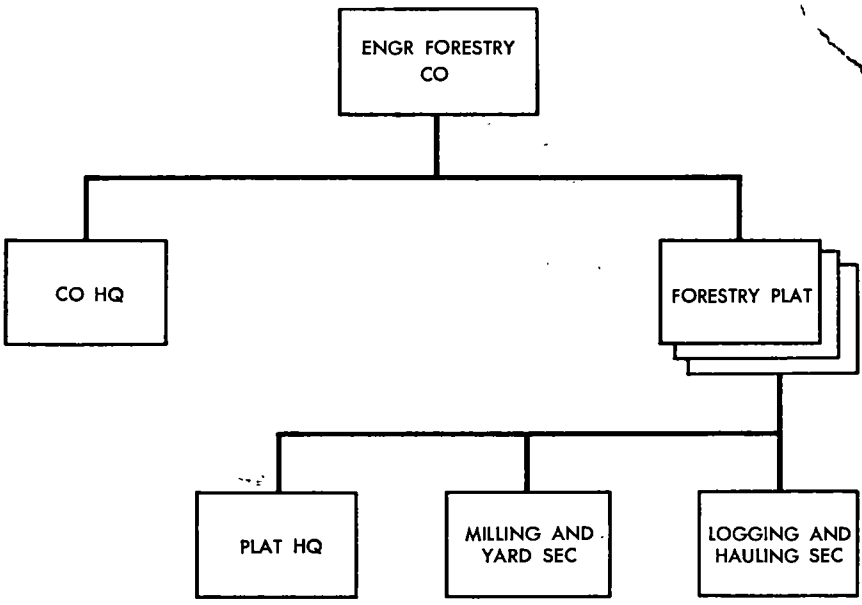
c. Individuals of this unit can fight as infantrymen when required. This unit has the capability of defending itself and its installations against hostile ground attack.

4. Basis of Allocation. One per maintenance and supply group in communications zone.

5. Category. III.

6. Mobility. Forty percent.

Section B. ORGANIZATION (fig. 54)



STRENGTH OFF 4 EM 142 AGG 146

TOE 5-387D

Figure 54. Organizational Chart Engineer Forestry Company.

Section C. MAJOR ITEMS OF EQUIPMENT

Vehicles

Truck, cargo ¾-T	1
Truck, cargo 2½-T	8
Truck, tractor 5-T	3

Engineer Equipment

Compressor, trk mtd 210 cfm	3
Crane-shovel, crlr mtd 10-T, ¾ cu yd	3
Logging equip set, trk mtd	3
Saw, chain 36 inch	9
Sawmill circ 60 inch	3
Supplement equip forestry co	1
Tool outfit pioneer ptbl elec tools	1
Tractor full trckd med	3
Tractor walking whl mtd 20 hp	3

Signal

Radio set AN/PRC–10	4

TOE 5–500C

ENGINEER SERVICE ORGANIZATION

1. Mission. *a.* To perform engineer technical and service operations where units of less than company size are required.

b. To increase the productive capacity of fixed strength units where increments of less than company size are needed. These teams are designed to provide organizations which differ in size and composition depending upon the tactical and logistical considerations involved.

2. Assignment. Teams may be attached or assigned as required to fixed strength units or may be organized into service units to perform engineer technical and service functions under varying conditions.

3. Capabilities. *a.* The capabilities of units organized under this table vary with the size and grouping of teams.

b. Mess teams and automotive maintenance teams will be drawn from TOE 29–500D. Basis for computation of teams required will be the number of personnel to be messed and the number of vehicle equivalents requiring organizational maintenance.

c. Individuals of these teams can fight as infantrymen when required.

4. Basis of Allocation. The allocation of units organized under this table will vary with the personnel requirements. Capabilities and allocation are indicated for each team in the detailed breakdown of teams.

5. Mobility. The degree of mobility must be computed for each specific combination of teams and/or composite units to be used.

PART 1. ADMINISTRATIVE AND HEADQUARTERS TEAMS

TEAM AA, PLATOON HEADQUARTERS (COMPONENT)

Capabilities. Command and administrative control of two or more service teams.

Strength. Off 1 EM 1 Agg 2

Basis of Allocation. One per 2 or more service teams with a strength of not less than 40 individuals. Not required if commissioned officers are assigned to the teams.

TEAM AB, PLATOON HEADQUARTERS (SEPARATE)

Capabilities. Command and administrative control of two or more teams not a part of a company.

Strength. Off 1 EM 3 Agg 4

Basis of Allocation. One per unit comprising 40 to 60 individuals. Not required if commissioned officers are assigned to teams.

TEAM AC, COMPANY HEADQUARTERS

Capabilities. Command and administrative control of two or more service teams.

Strength. Off 2 EM 6 Agg 8

Basis of Allocation. One per unit comprising 2 or more service platoons with an aggregate strength of not less than 120 individuals.

TEAM AD, BATTALION HEADQUARTERS

Capabilities. Command and administrative control of three or more service companies or a group of engineer units of company or smaller size with an aggregate strength of approximately 750 to 1,100 individuals; furnish direct administrative assistance to separate detachments which are not attached to companies.

Strength. Off 5 WO 2 EM 15 Agg 22

Basis of Allocation. One per group of 3 or more service companies or teams with an aggregate strength of 750 to 1,100 individuals.

PART 2. SUPPLY TEAMS

TEAM BA, GENERAL SUPPLY

Capabilities. Receives, stores, issues and maintains records of class II and IV supplies for approximately 35,000 troops.

Strength. WO 1 EM 23 Agg 24

Basis of Allocation. Normally augments engineer depot company, TOE 5–267, and may augment depot operating team BB, TOE 5–500; 1 per special task force up to 35,000 troops.

TEAM BB, DEPOT OPERATING

Capabilities. Operates a depot for the receipt, storage, and issue of engineer general supplies and equipment and maintains records of class II and IV supplies for approximately 90,000 troops.

Strength. Off 1 WO 1 EM 52 Agg 54

Basis of Allocation. Normally augments engineer depot company, TOE 5–267; 1 per special task force from 70,000 to 90,000 troops.

TEAM BC, EQUIPMENT SUPPLY

Capabilities. Operates a small depot for the receipt, assembly, servicing, issue, and shipment of engineer mechanical and electrical equipment in support of a small task force or base capable of equipment supply for a force which includes approximately 35,000 troops; assembly and initial conditioning of heavy engineer equipment for storage or issue to using units; inspection and minor repairs on heavy equipment in depot stock to insure serviceability and maintenance of equipment of while in storage.

Strength. WO 1 EM 30 Agg 31

Basis of Allocation. Augments engineer depot company, TOE 5–267, and engineer depot battalion, TOE 5–266, and may augment TOE 5–500, Depot Operating Team BB, 1 per special task force up to 35,000 troops.

TEAM BD, HQ ENGINEER SUPPLY CONTROL OFFICE

Capabilities. Provides the administrative personnel to staff a Theater Engineer Supply Control Office. When augmented by Teams BE, BF, BG, and BH, the unit comprises a Theater Engineer Supply Office capable of: Forcasting general engineer and repair parts supply requirements of a Theater of Operations to insure maintenance of adequate and realistic stock levels; evaluating stock status reports, tonnage reports, and other special supply reports as required; directing the distribution or relocation of supplies; assembling statistical data pertaining to engineer equipment population and distribution; general engineer repair parts usage experience, identifying and cataloging locally procured items and other pertinent stock control operations.

Strength. Off 3 WO 1 EM 15 Agg 19

Basis of Allocation. One per Theater Headquarters.

TEAM BE, GENERAL ENGINEER SUPPLY CONTROL TEAM

Capabilities. Provide the necessary supervisors, analysts and typists to exercise effective supply control over approximately 10,000 to 11,000 general engineer supply items. Maintains a balanced supply of general engineer items throughout the entire Theater of Operations. Forecasts requirements and resupply of general engineer items for future operations to insure the receipt and ultimate distribution of necessary supplies at the proper time and place.

Strength. Off 1 WO 1 EM 41 Agg 43

Basis of Allocation. One for control of approximately 10,000 to 11,000 general engineer items.

TEAM BF, ENGINEER REPAIR PARTS SUPPLY CONTROL TEAM

Capabilities. Provides the necessary supervisors, analysts and typists to exercise effective supply control over approximately 8,000 to 10,000 rapid turnover repair parts supply line items. Maintains a balanced supply of repair parts items throughout the entire Theater of Operations. Forecasts requirements and resupply of repair parts items for future operations to insure the receipt and ultimate distribution of necessary supplies at the proper time and place.

Strength. Off 1 WO 1 EM 41 Agg 43

Basis of Allocation. One for control of approximately 8,000 to 10,00 rapid turnover repair parts supply line items.

TEAM BG, DISTRIBUTION STOCK CONTROL TEAM

Capabilities. Provides the necessary qualified personnel to exercise effective stock control over all general engineer and repair parts items present in or requisitioned for a Theater of Operations. Works in close coordination with other teams of the Engineer Supply Control Office. Requisitions items from the zone of interior, directs shipments to various storage depots, diverts shipments as necessary, authorizes depot issues, controls shipments in and out of depots in accordance with regulations, controls the disposal of excess and unserviceable items. Based on data furnished by the Theater Army Engineer, with regard to future operations, prescribes depot missions so as to insure effective and proper distribution of available supplies.

Strength. Off 1 WO 1 EM 34 Agg 36

Basis of Allocation. One or more as required per Theater Engineer Supply Control Office.

TEAM BH, ENGINEER IDENTIFICATION AND CATALOGING TEAM

Capabilities. Identifies and catalogs repair parts and general engineer items of supply which have been locally procured or which through occurrence or omission have lost their identity. Maintains constant liaison with the Theater Procurement Office and local manufacturers to determine facilities and materials available. Prepares the necessary drawings and blueprints required when requesting bids from local manufacturers. Subsequent to inspection and acceptance of an item, the team in coordination with Team BG arranges for shipment of the item to a storage installation.

Strength. Off 3 WO 0 EM 15 Agg 18

Basis of Allocation. One or more as required per Theater Engineer Supply Control Office.

PART 3. MAINTENANCE AND PARTS TEAMS

TEAM EA, FIELD MAINTENANCE

Capabilities. Provides engineer field maintenance support for approximately 140 major items of engineer construction equipment or 90 vehicles equivalents.

Strength. EM 10 Agg 10

Basis of Allocation. Normally one per special task force requiring a maintenance force of less than a platoon of an engineer direct support maintenance company (or larger maintenance team).

TEAM EB, FIELD MAINTENANCE

Capabilities. Provides engineer field maintenance support for approximately 375 major items of engineer construction equipment or 180 vehicle equivalents.

Strength. WO 1 EM 21 Agg 22

Basis of Allocation. Normally one per special task force requiring a force of less than a platoon of an engineer direct support maintenance company or to augment an engineer direct support maintenance company.

TEAM EC, SPECIAL EQUIPMENT MAINTENANCE

Capabilities. Provides technically qualified personnel to operate a mobile machine shop for the repair of special engineer equipment, including sniperscopes, mine detectors, odographs, searchlights, and small quantities of other infrared devices, precision instruments, and similar items. Team is capable of maintaining approximately 1,050 sniperscopes, 700 mine detectors, 25 odographs, 6 searchlights, and miscellaneous items.

Strength. EM 8 Agg 8

Basis of Allocation. Normally one per engineer direct support maintenance company where there is a high concentration of special engineer equipment.

TEAM ED, PARTS

Capabilities. Provides parts supply support for 1,500 major items of engineer equipment employed by an engineer force operating in an area which does not require support of larger

parts supply units. Team can issue approximately 3,000 line items per month, and can store approximately 50 tons of repair parts or 9,000 line items.

Strength. WO 1 EM 17 Agg 18

Basis of Allocation. Normally one per special task force or one per Engineer Maintenance Company, Direct Support, TOE 5–237, and as required to support Engineer Parts Depot Company. TOE 5–279, and Engineer Heavy Maintenance Company TOE 5–278.

TEAM EE, REPAIR PARTS INSTRUCTOR-ADVISER

Capabilities. Provides technically qualified personnel for advising, instructing, and rendering assistance to engineer and engineer equipment using units on repair parts problems, such as interpretation of parts supply policies and procedures, procurement, distribution, supply and stock control, storage, utilization, distribution of excesses, and the recovery of repairable parts.

Strength. WO 1 EM 4 Agg 5

Basis of Allocation. To engineer supply control offices or similar organizations and Engineer Maintenance and Supply Group, TOE 5–262, as required.

TEAM EF, ENGINEER FIELD MAINTENANCE (NIKE-SEMIMOBILE)

Capabilities. Provides qualified personnel and equipment to accomplish third echelon maintenance support and repair parts supply support for engineer equipment organic to an Air Defense Artillery Missile Battalion TOE 44–435 and/or TOE 44–535, and the engineer equipment organic to the Mobile Missile Monitor System; or the engineer equipment organic to 5 AAA Battalion, 90-mm Gun, Mobile, TOE 44–15: may also provide limited fourth echelon maintenance support in an emergency situation.

Strength. WO 1 EM 18 Agg 19

Basis of Allocation. One per ADA Missile Battalion, Mobile NIKE-AJAX or HERCULES organized under TOE 44–435 or 44–535 or one per ADA Group, consisting of from 4 to 4 AAA Battalions, 90-mm Gun, Mobile, TOE 44–15, when the required maintenance services are not available from normal engineer field maintenance support.

TEAM EG, ENGINEER FIELD MAINTENANCE TEAM GUIDED MISSILE (CORPORAL)

Capabilities. Provides immediate field maintenance service for the engineer equipment organic to the Ordnance Guided Missile

Direct Support Company (CORPORAL), TOE 9–228, and three Field Artillery Missile Battalions, (CORPORAL), TOE 6–545. Such support will include repairing and/or replacing engines, assemblies or subassemblies, not above field maintenance level; maintaining balanced stocks of repair parts for use of organic maintenance personnel; receive and issue to supported units repair parts for organizational use; assemble and report, through engineer maintenance channels, statistical data on supported engineer equipment; inspecting organizational maintenance activities, technical inspection of engineer equipment; and furnishing advice on repair parts stock levels for organizational maintenance and their storage and usage.

Strength. WO 1 EM 7 Agg 8

Basis of Allocation. Normally attached to the Ordnance Guided Missile Direct Support Company (CORPORAL), TOE 9–228.

PART 4. FIREFIGHTING TEAMS

TEAM FA, FIREFIGHTING HEADQUARTERS

Capabilities. Planning for overall strategic fire defense; controls firefighting teams assigned or attached.

Strength. Off 1 EM 3 Agg 4

Basis of Allocation. Normally one per two to four firefighting teams and one water tank team.

TEAM FB, FIRE TRUCK

Capabilities. Establishes organized fire protection and fire prevention programs in areas to which assigned; will provide fire protection for areas housing 5,000 to 10,000 troops or warehouse and open stockpile storage of 100,000 square feet.

Strength. EM 6 Agg 6

Basis of Allocation. One per post, base, camp, or station housing 5,000 to 10,000 troops, or warehouse and open storage area of 100,000 square feet.

TEAM FD, WATER TANK

Capabilities. Transports water for firefighting purposes when insufficient water storage is available.

Strength. EM 2 Agg 2

Basis of Allocation. One per firefighting platoon; additional teams as required.

TEAM FE, BRUSH FIRE, TRUCK

Capabilities. This team, with volunteer personnel, will furnish

protection against brush or grass fires within its assigned area of operation and to a limited degree can also be utilized to combat structural fires.

Strength. EM 2 Agg 2

Basis of Allocation. One per post, base, camp or station housing up to 5,000 troops, or warehouse and open storage area of 100,000 square feet. Also, one per Field Artillery Missile Battery, Redstone, TOE 6–634.

PART 5. EQUIPMENT OPERATING TEAMS

TEAM GB, ROCK CRUSHER

Capabilities. Provides personnel for the operation of 50 tons per hour crushing and screening plant.

Strength. EM 4 Agg 4

Basis of Allocation. Normally attached to an engineer construction unit to furnish and operate equipment for production of crushed stone necessary for accomplishment of engineer construction missions.

TEAM GD, FORESTRY

Capabilities. Provides personnel and equipment necessary to conduct logging and sawmill operations for the production of rough lumber and timber piling. Capable of producing 10,000 to 15,000 board feet of rough lumber and timber piling per day.
Strength. Off 1 EM 42 Agg 43

Basis of Allocation. Normally attached to an engineer forestry company but may operate independently when the employment of an engineer forestry company is not warranted.

TEAM GE, WELL DRILLING

Capabilities. Provides supervisory personnel and equipment for drilling water wells; installs casings and pumps for wells to supply water to units or stations.

Strength. EM 2 Agg 2

Basis of Allocation. Normally attached to a construction unit which will provide additional personnel necessary for well-drilling operations.

TEAM GF, WATER PURIFICATION

Capabilities. Provides personnel and equipment for purifying up to 3,000 gallons of potable water per hour and storage facilities for 12,000 gallons.

Strength. EM 4 Agg 4

Basis of Allocation. Normally attached to a water supply company, but may operate independently when the employment of a water supply company is not warranted.

TEAM GG, WATER PURIFICATION

Capabilities. Provides supervisory personnel for the operation of a central water plant or a municipal water system. Operates single or multiple standard purification units forming a central plant supporting 6,000 to 60,000 individuals when augmented by utilities personnel operates central municipal water system supporting up to 200,000 personnel when augmented by utilities personnel, civilians, and/or prisoners of war.

Strength. Off 1 EM 11 Agg 12

Basis of Allocation. Normally one per engineer brigade.

TEAM GH, WATER TRANSPORT

Capabilities. Provides personnel and equipment for short hauls or from approximately 10 to 15 miles to transport water in bulk to water distribution points. Approximately 4,500 gallons may be transported at 1 trip. Daily capacity depends on such factors as length of haul, condition of roads, and situation, if in a zone subject to enemy attack.

Strength. EM 8 Agg 8

Basis of Allocation. Normally one per water supply company.

TEAM GI, GAS GENERATING

Capabilities. Provides necessary technically qualified personnel to operate 1 acetylene generating plant of 750 cubic feet per hour capacity and 2 oxygen and nitrogen generating plants of 1,000 cublic feet per hour capacity each. Unit operates and maintains machinery to generate acetylene, oxygen, and nitrogen gases, and to store limited quantities of these gases.

Strength. Off 1 EM 25 Agg 26

Basis of Allocation. Normally one attached to the engineer maintenance and supply group.

TEAM GJ, CARBON DIOXIDE GENERATING

Capabilities. Provides necessary technically qualified personnel for the generating, storage, and transportation of carbon dioxide in gaseous and liquid form and in the form of dry ice. Unit operates machinery for the generation of hydrogen and carbon dioxide gases, and to store limited quantities of these gases.

Strength. Off 1 EM 12 Agg 13

Basis of Allocation. Normally one attached to an engineer maintenance and supply group.

TEAM GK, QUARRYING AND PROCESSING

Capabilities. Provides personnel and equipment for the operation of the 225 tons per hour crushing-screening and washing plant. Provides necessary personnel and equipment for drilling and blasting operations required to produce raw stone for crushing.

Strength. Off 1 EM 36 Agg 37

Basis of Allocation. To Engineer Construction Battalion TOE 5–115, as required.

PART 6. CONSTRUCTION, UTILITIES, AND ELECTRICAL POWER TEAMS

TEAM HA, HEADQUARTERS, PORT CONSTRUCTION

Capabilities. Provides technically qualified personnel to augment an engineer staff section or unit for the performance of specialized phases of port planning, such as capacity, layout, site selection, design, material requirements, and special equipment needs.

Strength. Off 2 EM 2 Agg 4

Basis of Allocation. Normally one per engineer group when engaged in major port projects.

TEAM HB, DIVING

Capabilities. Provides personnel and equipment to perform marine diving in support of port construction and rehabilitation and other types of engineer construction, including underwater pipelines which may require diving personnel and equipment.

Strength. Off 1 EM 9 Agg 10

Basis of Allocation. Normally one per engineer group when engaged in major port or underwater pipeline projects.

TEAM HC, WELDING

Capabilities. Provides technically qualified welders and equipment for attachment to units when the organic personnel and equipment are inadequate.

Strength. EM 4 Agg 4

Basis of Allocation. Normally one per engineer construction group and two per engineer maintenance and supply group.

TEAM HD, UTILITIES

Capabilities. Provides personnel and equipment for maintenance of utilities at installations up to 2,500 individuals; provides post engineer service to oversea or theater of operation installations; maintains utilities; and furnishes utilities service and repair, including refrigeration maintenance.

Strength. Off 1 EM 27 Agg 28

Basis of Allocation. Normally one per oversea camp, base, depot, or installations up to 2,500 individuals.

TEAM HE, UTILITIES

Capabilities. Provides personnel and equipment for maintenance of utilities at installations up to 4,000 individuals provides post engineer service in oversea or theater of operation installations; maintains utilities and furnishes utilities service and repair, including refrigeration maintenance.

Strength. Off 1 WO 1 EM 44 Agg 46

Basis of Allocation. Normally one per overseas camp, base, depot, or installations up to 4,000 individuals.

TEAM HF, UTILITIES

Capabilities. Provides personnel and equipment for maintenance of utilities at camps, bases, and depots for installations up to 6,000 individuals; provides post engineer service in oversea or theater of operation installations; maintains utilities and furnishes utilities service and repair, including refrigeration maintenance.

Strength. Off 2 WO 1 EM 52 Agg 55

Basis of Allocation. Normally three in communications zone area per supported field army.

TEAM HG, UTILITIES

Capabilities. Provides personnel and equipment for maintenance of utilities at camps, bases, and depots for installations up to 10,000 individuals; provides post engineer service in oversea or theater of operation installations; maintains utilities; and furnishes utilities service and repair, including refrigeration maintenance.

Strength. Off 3 WO 1 EM 79 Agg 83

Basis of Allocation. Normally one per type field army and two in communications zone per supported field army.

TEAM HH, POWERLINE

Capabilities. Provides technically qualified personnel and tools for the installation of high voltage electric powerlines and the maintenance of approximately 60 miles of high voltage electric powerlines.

Strength. Off 1 EM 12 Agg 13

Basis of Allocation. Normally one per two electric power generating plants of 300 to 2,500 kilowatt capacity.

TEAM HI, POWERPLANT MAINTENANCE

Capabilities. Provides technically qualified personnel and equipment for maintenance of electric power generating plants of 300 to 2,500 kilowatt capacity when welding team HC is attached, and furnishes supervisory personnel for construction and rehabilitation of such plants.

Strength. WO 1 EM 12 Agg 13

Basis of Allocation. Normally one per two electric power generating plants of 300 to 2,500 kilowatt capacity.

TEAM HJ

Capabilities. Provides technically qualified personnel for the operation of electrical power plants containing from one to three diesel engine driven generators, capacities of which range from 300 to 2,500 kilowatts.

Strength. Off 1 EM 10 Agg 11

Basis of Allocation. Normally four per engineer brigade in communications zone area.

TEAM HK, FOUNDRY

Capabilities. Provides technically qualified personnel for the operation of one set of engineer foundry equipment.

Strength. Off 1 EM 12 Agg 13

Basis of Allocation. Normally one per engineer depot maintenance company when foundry service is required.

TEAM HL, FLOATING POWERPLANT

Capabilities. When augmented by one mess team CA and two mess teams CB from TOE 29–500, this unit is capable of 24-hour operation for extended periods at full rated load; providing continuous 3 phase, 60 cycle, electric power in quantities up to 34,500 kw at output voltages between 13,800 and 115,000 volts; supplying electric power to civilian or military installations near shore,

harbor, or navigable stream at proper voltages by means of variable step-up transformers; supplying electric power to shore and inland areas by means of connection to existing transmission lines. Capable of routine and emergency maintenance and minor repairs of equipment by assigned personnel. Towing vessel is required to move this ship.

Strength. Off 5 WO 1 EM 60 Agg 66

Basis of Allocation. As required in theater of operations, communications zone and zone of interior.

TEAM HM, RAILWAY MOUNTED POWERPLANT

Capabilities. Provides electric power for direct support of our Armed Forces and to meet any critical power for military installations, industrial plants, or limited population centers at proper voltages through variable step-in transformers; to meet varying foreign and domestic situations of either 50 or 60 cycle current under a wide variety of output voltages; supply electrical power to areas by means of connection to existing transmission lines; capable of 24-hour operation for extended periods of full rated load, with powerplant operation to be carried on by assigned personnel; capable of routine and emergency maintenance and minor repairs of equipment by assigned personnel but is not self-propelled, and a towing engine must be furnished.

Strength. Off 2 EM 14 Agg 16

Basis of Allocation. As required in theater of operations and zone of interior.

TEAM HN, ENGINEER CAMOUFLAGE (HEAVY WEAPONS)

Capabilities. Provide personnel and equipment for the employment of the Decoy Target Gun 280-mMw/carriage Medium Fiderlity Pneu w/carrying case in a theater of operations.

Strength. Off 1 EM 36 Agg 37

Basis of Allocation. Normally one per 280-mm Gun, Field Artillery Battalion in the theater of operations. As required when other deceptive operations are contemplated.

PART 7. TOPOGRAPHIC AND INTELLIGENCE TEAMS

TEAM IA, SURVEY

Capabilities. Provides technically qualified personnel and equipment for the survey operations of one party.

Strength. EM 14 Agg 14

Basis of Allocation. Normally one per engineer brigade.

TEAM IB, SURVEY PLATOON

Capabilities. Provides technically qualified personnel and equipment for three survey parties, and limited preparation of map manuscript.

Strength. Off 1 EM 39 Agg 40

Basis of Allocation. Normally attached to Engineer Base Survey Company, TOE 5–348, when mapping operations require additional effort but less than a base survey company.

TEAM IC, PHOTOMAPPING PLATOON

Capabilities. Provides technically qualified personnel and equipment for the preparation of topographic maps by multiplex methods from aerial photographs.

Strength. Off 1 WO 1 EM 77 Agg 79

Basis of Allocation. Provides technically qualified personnel and equipment for the production of maps from original manuscripts, and limited quantities of photostats.

Strength. Off 1 WO 1 EM 51 Agg 53

Basis of Allocation. Normally attached to Engineer Base Reproduction Company, TOE 5–347, when mapping operations require additional effort but less than a base reproduction company.

TEAM IE, MAP DEPOT PLATOON

Capabilities. Provides technically qualified personnel and equipment for the receipt, storage, issue, and distribution of maps of a base, army, or corps headquarters. Platoons can operate as a depot.

Strength. Off 1 EM 38 Agg 39

Basis of Allocation. Normally three per army topographical battalion for forward depots.

TEAM IF, RELIEF MAP MAKING

Capabilities. Provides technically qualified personnel and equipment to construct original terrain models at scales from 1:5,000 through 1:50,000 and produces quantities of plastic reproduction at these scales.

Strength. WO 1 EM 17 Agg 18

Basis of Allocation. Normally one per base topographical battalion.

TEAM IG, TECHNICAL INTELLIGENCE (COLLECTION)

Capabilities. Provides technically qualified personnel and equipment for finding, collecting, identifying, photographing, and reporting on elements of engineer technical intelligence, such as, foreign engineer material (equipment), construction, organization, training, tactics, techniques, installations, and fortifications; also illustrating and preparing training aids and instruction in the use of, or counteracting, enemy engineer materiel.

Strength. Off 3 EM 6 Agg 9

Basis of Allocation. Normally one per corps.

TEAM IH, TECHNICAL INTELLIGENCE, RESEARCH

Capabilities. Provides technically qualified personnel and equipment for collecting, receiving, evaluating, photographing, and reporting on elements of engineer technical intelligence, such as: engineer materiel, construction, organization, training, tactics, techniques, installations, fortifications, and research and development; illustrating and preparing training aids of items of engineer intelligence. Assists with the interrogation of enemy military and civilian personnel for engineer intelligence, and coordinates the activities of engineer technical intelligence teams IG (Collection).

Strength. Off 5 EM 8 Agg 13

Basis of Allocation. Normally one per type field army.

TEAM IJ, GEODETIC SURVEY

Capabilities. Provides technically qualified personnel for instruction and/or supervision of units engaged in high order geodetic surveys and computations as required in a theater of operations survey program and as otherwise required in the field army for guided missile support.

Strength. Off 4 WO 1 EM 7 Agg 12

Basis of Allocation. One per theater of operations and normally one per field army when required.

TEAM IK, TERRAIN

Capabilities. Provides technically qualified personnel and equipment for the collection, evaluation, and dissemination of terrain data; the production of terrain studies; and provision of consultant services in military geology and military hydrology.

Strength. Off 6 EM 5 Agg 11

Basis of Allocation. Normally one per type field army but may be assigned at a lower level.

TEAM IL, TOPOGRAPHIC LIAISON

Capabilities. Map program planning and technical supervision of map compilation; surveying and geodetic activities including supervision, collection, maintenance and dissemination of survey control data; supervision and coordination of map reproduction including evaluation of reproduction facilities and planning the employment of such facilities in the map reproduction program; supervision of the topographic and map supply program including operation of map depots and supply points throughout the command. Maintains liaison with higher headquarters and allied armies. Supervises non-United States indigenous production and mapping agencies used in the program.

Strength. Off 7 WO 1 EM 9 Agg 17

Basis of Allocation. One per theater, army group, field army, headquarters, or base topographic battalion as required.

TEAM IM, PHOTOGRAPHIC EVALUATION

Capabilities. Provides technically qualified personnel and equipment for assisting photographic units in accomplishing aerial cartographic photography suitable for compilation of military topographic maps, also the evaluation of such photography to determine its suitability for the required purpose.

Strength. Off 1 WO 0 EM 8 Agg 9

Basis of Allocation. As required, normally attached to Headquarters and Headquarters Detachment, Engineer Base Topographic Battalion.

PART 8. DREDGE CREWS

TEAM JA, 20 IN. CUT PIPELINE DREDGE

Capabilities. When augmented by labor personnel from TOE 10–67 or other available labor sources and a minimum of one mess team CA and one mess team CB from TOE 29–500, this unit provides personnel for the operation and maintenance of the engineer dredge, non-self-propelled diesel powered, 20 inch cutterhead type, pipeline.

Strength. Off 4 WO 6 EM 48 Agg 58

Basis of Allocation. As required.

TEAM JB, 24 IN. CUT PIPELINE DREDGE

Capabilities. When augmented by labor personnel from TOE 10–67 or other available labor sources, and a minimum of one mess team CA and one mess team CB from TOE 29–500, this unit provides personnel for the operation and maintenance of

the engineer dredge, turbine powered, 24 inch cutterhead type, non-self-propelled, pipeline.

Strength. Off 3 WO 6 EM 38 Agg 47

Basis of Allocation. As required.

TEAM JC, 700 CU. YD. DIESEL ELECTRIC, SEAGOING DREDGE

Capabilities. When augmented by a minimum of one mess team CA and one mess team CB from TOE 29–500, this unit provides personnel for the operation and maintenance of the engineer dredge seagoing hopper, diesel electric powered, 700 cubic yard.

Strength. Off 5 WO 4 EM 39 Agg 48

Basis of Allocation. As required.

TEAM JD, 1400 CU. YD. DIESEL ELECTRIC, SEAGOING DREGE

Capabilities. When augmented by a minimum of one mess team CA and one mess team CB from TOE 29–500, this unit provides personnel for operation and maintenance of the engineer dredge, seagoing hopper, diesel electric powered, 1400 cubic yard.

Strength. Off 8 WO 4 EM 40 Agg 52

Basis of Allocation. As required.

TEAM JE, 2700 CU. YD. DIESEL ELECTRIC SEAGOING DREDGE

Capabilities. When augmented by a minimum of one mess team CA and one mess team CB from TOE 29–500, this unit provides personnel for the operation and maintenance of the engineer dredge, seagoing hopper, diesel electric powered, 2700 cubic yard.

Strength. Off8 WO 4 EM 44 Agg 56

Basis of Allocation. As required.

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BY ORDER OF THE SECRETARY OF THE ARMY:

G. H. DECKER,
General, United States Army,
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

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For explanation of abbreviations used, see AR 320–50.

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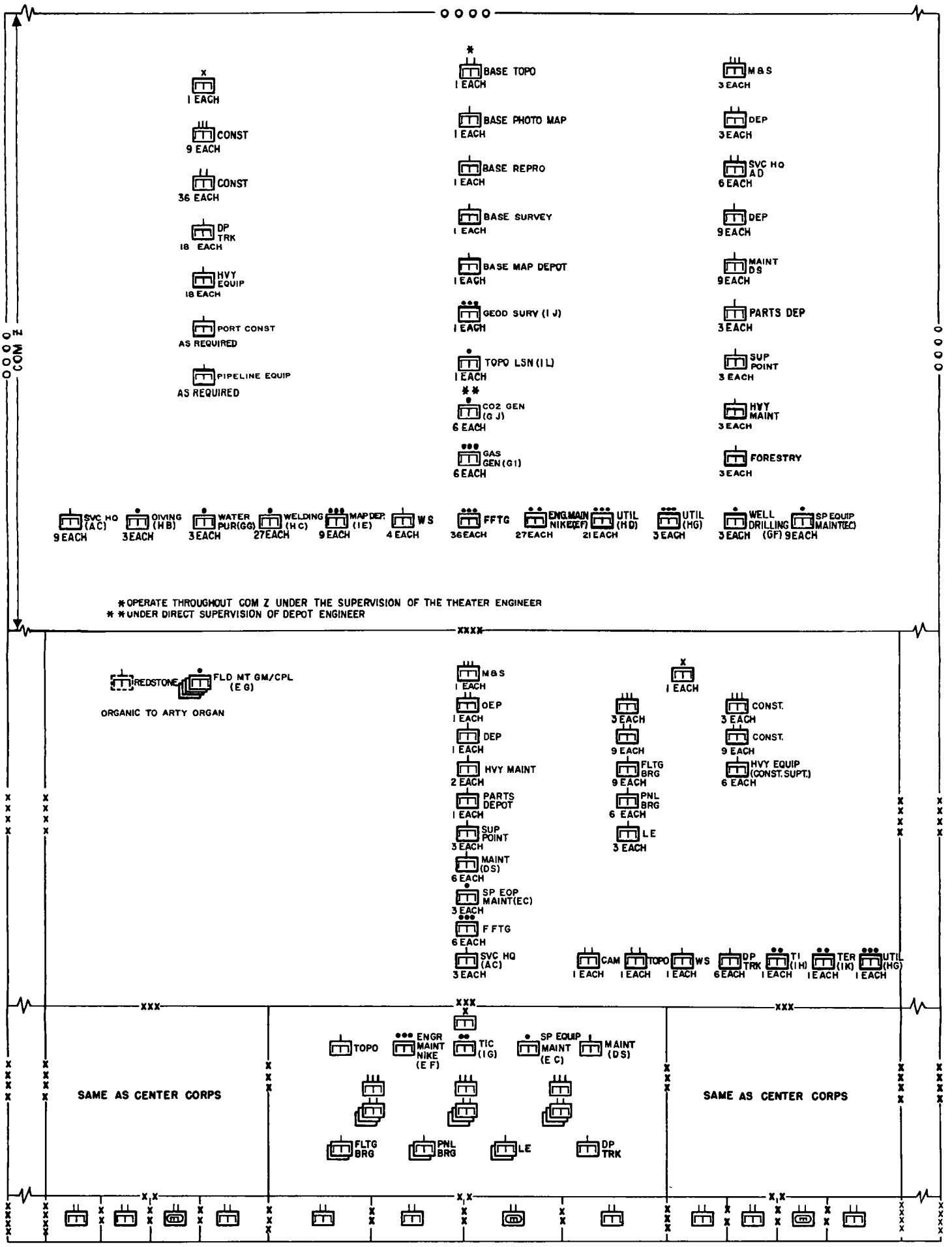


Figure 5. Engineer support for type field army and communications zone.

Reference

FM 5–1
C 1

FIELD MANUAL

ENGINEER TROOP ORGANIZATIONS AND OPERATIONS

FM 5–1
CHANGES No. 1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *17 July 1962*

FM 5–1, 18 May 1961, is changed as follows:

An asterisk indicates the portions of these changes which reflect the new U.S. Army division organization *(ROAD)*, so far as the new organization affects the Corps of Engineers. It is recognized that all existing Army divisions will not be be reorganized simultaneously: hence, these corrections are intended for only those users of Field Manual 5-1 who are operating under the new organiusers of Field Manual 5-1 who are operating under the new organiorganization, the original manual remains valid and the indicated portions should be disregarded until such time as they become applicable.

---

* Throughout manual change "battle group" to **brigade.**
* Throughout manual change "combat command" to **brigade.**

Table I. Engineer Unit Classification (Superseded)

Classification	Divisional	Nondivisional	Construction	Intelligence mapping and geodetic	Maintenance and supply
Category I	Mechanized and Armd Div Engr Battalion. Inf Div Engr Battalion. Abn Div Engr Battalion.	Engr Amph Supt Command. Engr Cmbt Bn, Army. Engr Cmbt Co. U.S.A. Msl Cmd., Air Transportable.			
Category II	----------	Hq & Hq Co, Engr Brigade. Hq & Hq Co, Engr Combat Group. Lt Eqp Co. Panel Bridge Co. Float Bridge Co.	Hq & Hq Co, Engr Const Hp. Const Bn. Pipeline Eqp Co. Const Spt Co.	Topo Bn, Army Topo Co., Corps. ---------- ----------	Sup Pt Co. Water Sup Co. Engr Maint Co (DS). Engr Co. REDSTONE.
Category III	----------	----------	Dump Truck Co. Port Const Co.	Camou Bn. Base Topo Bn.	M&S Group Depot Bn Depot Co. Hvy Mt Co. Parts Depot Co.

*27. Engineer Section
(Superseded)

The division engineer section at the division command post is under the supervision and control of the assistant division engineer. It consists of a liaison officer, a combat construction foreman and his assistant, a combat construction draftsman, and two radio operators. The assistant division engineer represents the division engineer at division headquarters, and when necessary makes decisions for him. The assistant division engineer is responsible for maintaining the engineer situation maps at division headquarters and insures their accuracy and timeliness. He is also responsible for keeping the engineer battalion headquarters informed of the activities and plans of the division headquarters.

CHAPTER 4

ENGINEER SUPPORT IN A TYPICAL THEATER OF OPERATIONS

* * * * * * *

*Section II. ENGINEER SUPPORT FOR DIVISION
(Superseded)

39. Army Divisions (Except Airborne)

a. Organic to each army division is an engineer battalion. This divisional engineer battalion is a self-contained unit designed to provide engineer combat support in the forward portion of the battle area. It has the ability to overcome a great variety of obstacles to the movement of the division, and, hence, contributes greatly to the mobility of the division and its capability to maneuver in offensive action. In defense, retrograde, or denial operations the divisional engineer battalion has the capability of impeding the progress of the enemy ground operations by blocking critical avenues of approach of enemy ground combat vehicles.

b. The engineer battalion operates as part of division troops when required. Its companies are placed in support of or attached to the brigades and combat elements of the division. The headquarters company and the bridge company contain engineer construction equipment and stream crossing equipment with operators and specialists to appropriately supplement the engineer companies for specific tasks.

c. Engineer companies are associated, normally, with particular brigades so as to increase operational efficiency. When in support

of or attached to the brigade, the company commander performs the unit engineer function of tactical engineer staff planning and execution of the engineer missions. Continuous liaison is maintained by the company to the brigade when in this role.

d. When supporting a brigade the engineer company is employed under centralized control of the engineer battalion. An engineer company may be attached to a brigade for specific operations or when centralized battalion control is impracticable. Platoons are placed in support of battalion or task force operations for specific missions. They may be attached for specific operations or when control by the company commander is impracticable.

e. When specific tasks require engineer teams or less than platoon size, these teams are normally attached to the combat elements to permit close command control. In the offense, such tasks may consist of erecting the AVLB, assault breaching of fortified positions, or executing demolitions. In defense or retrograde action, the execution of demolitions and the employment of ADM also may require attachment of engineer teams.

f. Engineer troops engage in limited combat incidental to accomplishment of their normal missions. Generally, engineer units are relieved early by other combat units to permit continuation of engineer missions. When exigencies of the situation require deliberate engagement of the engineer battalion in combat mission, it is desirable to preserve unit integrity.

g. When the armored cavalry squadron or task force organizations are committed on separate missions, an appropriate engineer element is attached to the force. Attached engineers should be mounted in vehicles similar to those of the supported force to insure the same tactical mobility.

h. In airmobile operations the amount of engineer effort required should be considered and planned for. Engineer support may be required at loading areas and access routes thereto. The extent of engineer effort that is, or will be, required at landing/drop zones must be considered also when organizing airmobile task forces so that sufficient engineers and engineer equipment are provided.

40. Airborne Division

As in the infantry, mechanized infantry, and armored divisions, engineer support is provided as the situation indicates. However, in the airborne assault a portion of the battalion may be required in the development of air-landing facilities. This development may vary from no engineer effort to total engineer effort. In the event the latter should be true, the division commander will determine priority of engineer effort if additional airborne engineer support

cannot be provided. Frequently in the airborne assault, an engineer company is attached to each committed brigade, particularly in those cases where the situation in the area of operations is unknown. As the situation permits, the engineer regains control of all of his elements and provides general and direct support to elements of the division as appropriate.

41. Additional Support

When the requirement for engineer support within the division exceeds the capability of the divisional engineer battalion, additional engineer support must be provided by the next higher echelon of command.

a. The additional engineer support to the division may range from reinforcement of the combat engineer strength, to the provision of such support as bridging, road construction, debris removal construction of barriers, mapping and other engineer intelligence, survey, camouflage, and deception.

b. Nondivisional engineer units normally are placed in support of the division. Engineer units are attached, however, when support cannot be furnished under corps control, such as hasty river crossing, execution of demolitions, and ADM employment. All engineer combat support provided to the division is coordinated by the division engineer.

51. Engineer Support of U.S. Army Missile Commands

* * * * * * *

c. U.S. Army Missile Command (Air Transportable).

* * * * * * *

(2) (Superseded). The organic engineer support is provided by an engineer combat company, TOE 5–38, which is similar to an engineer combat company, Army, augmented with survey and water supply teams.

58. General

(Superseded)

a. The purpose of the offense is to destroy the enemy's armed forces, to impose the commander's will on the enemy, or to seize territory to further operations against the enemy. An offensive operation may take the form of an envelopment (including turning movement), penetration, or exploitation (including pursuit). Regardless of the form of maneuver, an offensive operation has three main phases—advance to contact, development, and attack.

b. Offensive operations are characterized by swift maneuver, violent assault, and rapid exploitation. Upon seizing the objective,

a minimum force consolidates gains while the bulk of the attacking forces disperses rapidly. Offensive operations in a nonnuclear conflict differ from those in nuclear war only in regard to the combat power. A principal consideration in nonnuclear warfare is the fact that it can suddenly become nuclear. Hence, regardless of whether or not the situation is nuclear, any concentration of troops and material which offers an attractive target is undertaken only as a calculated risk.

***59. Engineers in the Advance**

* * * * * * *

**b. Advance Guard.* The fourth sentence, beginning "During the advance" and ending "of the advance guard" (Superseded).

During the advance of a **brigade,** a platoon from the supporting engineer company normally forms a part of the advance guard.

* * * * * * *

***60. Engineers in the Development and the Attack**

The first sentence seventh line, delete the phrase "Maintenance of engineer equipment,"

* * * * * * *

***62. Control**

* * * * * * *

**b. Liaison.* (Superseded) It is the responsibility of the supporting unit to establish and maintain liaison with the supported organization. The assistant division engineer is the chief liaison agent between the engineer battalion and division headquarters. Liaison functions between a supporting engineer company and a brigade are performed by personnel designated by the company commander. The liaison officer, usually the company executive officer, is familiar with the capabilities and operations of both units and keeps himself informed of all plans and operations to give reliable and up to date information and advice to both commanders. If engineer units are segmented in platoons or squads, each element establishes liaison with its supported organization.

64. Economy of Engineer Effort

There are seldom * * * pioneer tasks as—

* * * * * * *

g. (Added) Reduction of obstacles.

***65. Reconnaissance**

* * * * * * *

b. (Superseded) Engineer reconnaissance elements accompany the advance party of each leading brigade to provide the unit engi-

neer with timely warning of engineer requirements to the front. Terrain which appears favorable to the advance is closely examined, especially for possible enemy use of mines, obstacles, and defending weapons.

* * * * * * *

*66. Supply
(Superseded)

a. The army division has, as a major subordinate unit, a division support command which is organized on a functional basis. It provides the following logistical support to all elements of the division—supply, transportation of supply (less class V), third echelon field maintenance (except cryptographic and electrical accounting equipment), medical service, and miscellaneous services. The division support command is an operational command directly under the division commander.

b. The principal supply functions of the engineer divisional battalion are those of procurement and evacuation within the organization.

c. The division engineer battalion has five water supply teams, each having a water purification set. There are enough water supply specialists and helpers and enough transportation to operate the sets independently in establishing the water supply points required by the division. One team is in support of each brigade, one is in support of the support command, and one is kept in reserve. The tactical situation and the sources of water normally dictate the location and the hours of operation of water supply points. Road nets, parking area, and concealment are other important considerations. Normally, units are permitted to draw water at any time the water point is in operation.

70.1 Gap Crossing
(Added)

Gaps frequently found in the combat zone consist of antitank ditches, road craters, streams, canals, washouts, ravines, marshy ground, railroad cuts, and other similar obstacles. The armored vehicle launched bridges (AVLB) are used to cross short gaps in a minimum of time and with a minimum of exposure of bridging personnel to enemy fire. Rapid placement of bridging assists in maintaining the momentum of attack. To save time and labor in emergencies, the AVLB may be used on main supply routes. Components of the light tactical raft, the M4T6, and the class 60 bridge sets can be used also to span short gaps with fixed bridging. When the AVLB, or components of the float bridge sets are used as expedient bridging, they should be replaced at the earliest opportu-

nity in order to free the tactical bridging for use in the forward combat areas.

*72. Airborne Operations

* * * * * * *

*b. *Employment.* (Superseded) An engineer company normally is attached to each brigade for the airborne assault, reverting to battalion control as early as possible after the assault. The remaining companies are kept under battalion control. Construction equipment, organic to headquarters and headquarters company is attached as required to the engineer companies.

*c. *Organization for the Assault.* The engineer battalion normally is organized into three echelons:

*(1) First sentence, delete the word "two".

*d. *Operations.*

* * * * * * *

*(2) Delete "and conducting river crossings,"

* * * * * * *

73. Amphibious Operations

(Superseded)

a. General. Basic guidance for participation by Army forces in amphibious operations is contained in FM 31–12. Engineer units, as part of an army landing force, perform basic engineer tasks which do not differ appreciably from those performed in normal land operations. In an amphibious attack, a landing beach is itself an obstacle to be breached and crossed. Beach support area facilities must be constructed or improved to permit a continous landing of forces and a progressive establishment of combat service support means ashore.

b. Organization for the Assault.

(1) *Divisional engineer units.* Elements of divisional engineer battalions are included in landing teams formed by assault divisions. The composition of landing teams will vary with the situation; however, a brigade landing team normally will include an engineer company, elements of which will be further attached to infantry battalions. One of the first tasks of combat engineer teams landing in the initial assault waves is the clearance of gaps through minefields and other beach obstacles. Once ashore, the balance of the division engineer battalion is employed on normal combat support tasks.

(2) *Nondivisional units* Engineer combat battalions, Army, are attached to assault divisions as required to supplement the division engineer effort. Elements of the EASC

(par. 9*b*) also are attached to assault divisions and are the nuclei of shore parties formed at division and subordinate landing team levels. In addition, category II and III engineer units (table I) are included in the landing force task organization as required. Engineer units required to develop and operate beach support area facilities for support of the landing force normally will be included in shore parties at landing force or assault division level.

c. Base development. A landing force commander may be responsible for initiating base development projects essential to the support of forces landing subsequent to termination of the amphibious operation. Engineer construction units involved in base development projects may not be included, however, in shore parties. If the landing force commander assigns responsibility for initiation of base development projects to a subordinate division commander, he normally will attach the required engineer construction units. Alternatively, construction units may be attached to a subordinate division for landing only and remain responsible to the landing force or appropriate engineer commander for accomplishment of their construction mission. For example, elements of an engineer group may be attached to a division for the landing only, with the mission of initiating port construction under the command of the engineer group commander.

*74. General

***a.** Delete first sentence.

*79. Supply

(Rescinded.)

88. Security and Delaying Operations Barriers and Obstacles

(Superseded)

The barrier and obstacle support provided by engineer units in retrograde operations do not differ materially from that provided in defensive operations. The barriers constructed are composed of demolitions, minefields, abatis, and other obstacles, as well as those resulting from the employment of ADM. Particular emphasis is placed on the preparation of demolitions to be executed by engineer demolition firing teams attached to the rear guards, the security forces, and the covering forces; the hasty installation of obstacles covering the delaying positions to be occupied by the rear guard, security, and covering forces; and the employment of nuisance mines.

89. Denial Operations
(Superseded)

Denial planning in the combat zone is based on theater denial policies and plans. Those denial targets with both strategic and tactical significance usually are assigned to the tactical commanders (divisions) for preparation and execution. They include such targets as major bridges, tunnels, and dams. Other types of targets, such as industrial plants, airfields, and ports may be assigned to tactical commanders when the situation warrants such action; however, they may be assigned to special engineer demolition teams under the control of field army or higher headquarters. General and special staff responsibilities are the same for denial operations plans as for barrier plans. The G3 has overall staff responsibility and the engineer has special staff responsibility. In retrograde operations, engineer units support the tactical units by planning, preparing, and executing denial targets, usually demolition with conventional explosives or ADM. All troops, however, participate in certain aspects of denial operations by the destruction or removal of organic equipment and supplies.

*90. Supply
(Rescinded.)

*105. Responsibilities

* * * * * * *

*h. *(Added)* Map distribution within the division is accomplished by the supply and transportation battalion of the division support command, in accordance with priorities of allocations made by the G2, after coordination with the G3 and the S2 of the engineer battalion. The engineer battalion S2 procures and distributes maps for the engineer battalion.

*107. Mapping Operations

* * * * * * *

*f. *Distribution.*

* * * * * * *

*(2) (Superseded) Map supply is decentralized to the extent necessary to insure prompt and efficient service. Requirements are computed by the engineer, under the staff supervision of G2. Requisitions are prepared and submitted through engineer channels in time to permit the reproduction and shipment of the maps required. Emergency requisitions must be held to an absolute minimum, for a large volume of such requisitions will disrupt and destroy any reproduction program and map distribution

system in a short time. Engineers of corps and larger units are responsible for the distribution of military maps in the field, except such confidential and secret maps as may require special distribution. They obtain maps not printed by their echelons from the engineer of the next higher echelon.

*g. *Depots.* Change the third sentence from the end of the subparagraph to read: "Operations of the division map stores is

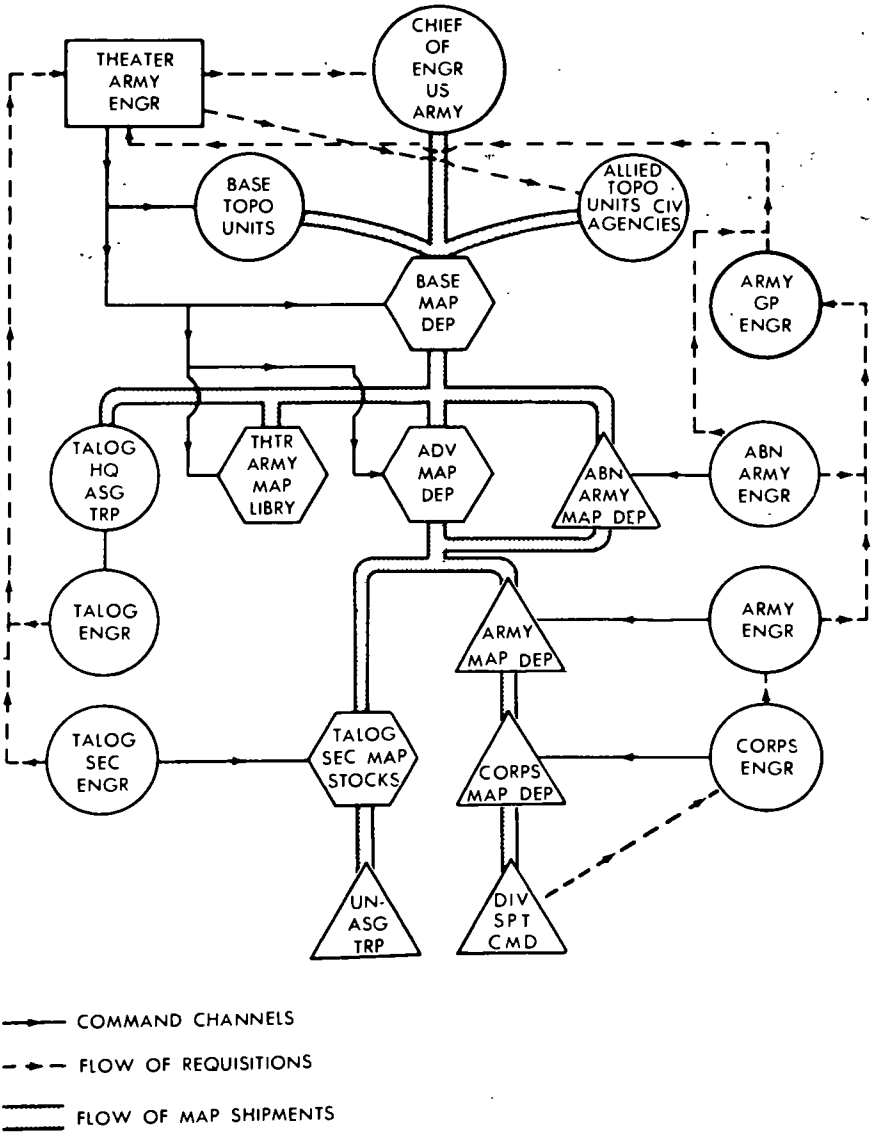


Figure 6. (Superseded) *Flow chart.*

the responsibility of the division **support command which** receives bulk stocks, distributes maps to divisional and attached units, and stores the division reserve map stocks."

*177. Organization of Maintenance Support

* * * * * * *

b. Combat Zone. (Superseded) Usually the units in the combat zone perform first and second echelon maintenance on the equipment they use. To discharge its organizational maintenance responsibilities, the division engineer battalion has a battalion maintenance section. This section performs second echelon maintenance for all the companies of the battalion and is under the control of the maintenance officer. In the division the maintenance battalion of the division support command performs the inspection of organizational maintenance, repair parts supply, and third echelon repair for all engineer equipment. The engineer battalion maintenance section requisitions repair parts from the support company supporting it. The basis of requisition will be to replenish its prescribed loads of repair parts.

APPENDIX II

EXTRACTS FROM TABLES OF ORGANIZATION AND EQUIPMENT

* * * * * * *

The following material, including illustrations, are added after page 291.

ARMORED DIVISION ENGINEER BATTALION
or
MECHANIZED DIVISION, ENGINEER BATTALION

Section A. GENERAL

1. Mission. *a.* To increase the combat effectiveness of the armored and mechanized divisions by means of general engineer work.

b. To undertake and carry out infantry combat missions when required.

2. Assignment. Organic to armored division, TOE 17, and mechanized division, TOE 37.

3. Capabilities. Provides engineer support for the armored and mechanized divisions as follows:

a. Engineer staff planning and supervision for organic and attached engineer troops.

b. By performing construction, repair and maintenance of roads, bridges, fords, and culverts.

c. Provides support of hasty stream crossing operations with boats, rafts, and bridges; and coordinates organic and attached engineer troops in support of deliberate stream crossings.

d. Provides fixed bridging for passage of short gaps.

e. Assists in the removal of obstacles, including mines and boobytraps.

f. Assists in the emplacement of obstacles, including mines and boobytraps.

g. Prepares and executes demolitions, including employment of atomic demolition munitions.

h. Assists other troops in preparation of fortifications and camouflage.

i. Performs engineer reconnaissance and intelligence.

j. Provides general construction including construction of landing strips.

k. Provides construction and placement of deceptive devices.

l. Performs organizational maintenance for equipment organic to the battalion.

m. Provides water purification and supply.

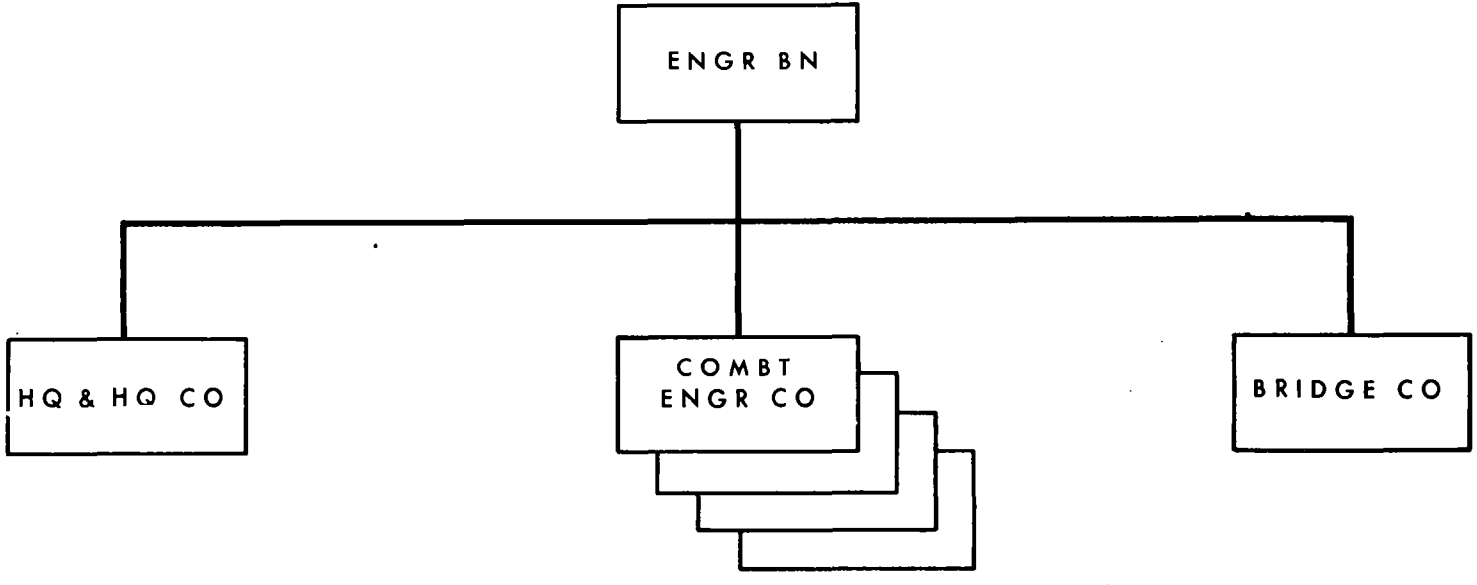
n. Provides technical advice to supported units in engineering matters, including recommendations for employment of engineer troops.

o. Assists in the assault of fortified positions.

p. Exploits locally available sources of materials for construction, fortifications, and camouflage.

4. **Basis of Allocation.**	One per armored division, TOE 17, and one per mechanized division, TOE 37.
5. **Category.**	I
6. **Mobility.**	One hundred percent.

Section B. ORGANIZATION (fig. 55)



STRENGTH OFF 45 WO 2 EM 939 AGG 986

Figure 55. Organizational chart of armored division or mechanized division engineer battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons	*AGG*	*Breakdown Within Organic Units*		
		146	*147*	*148*
Guns machine 7.62 mm LW	73	9	13	12
Launcher grenade, 40 mm	84	6	18	6
Launcher rocker 3.5 inch	61	5	12	8
Vehicles				
Carrier personnel fully trkd	40		10	
Combat engineer vehicle	8		2	
Semi trailer low bed 25–T	9	3	1	2
Semi trailer low bed 60–T	1			1
Tank recovery vehicle, med	2	2		
Truck cargo 2½-Ton	28	11	3	12
Truck dump 5-Ton	35	7	7	
Truck tank fuel servicing 2½-Ton.	7	1	1	2
Truck tractor 10-Ton	10	3	1	3
Truck utility	43	17	4	9
Truck van shop 2½-Ton	1	1		
Truck wrecker med 5-Ton	1	1		
Truck cargo ¾-Ton 4 x 4	11			
Engineer Items				
Boat landing inflat assault craft 15 man	18			18
Boat recon pneu 3-man	15	3		12
Bridge armored vehicle launched scissoring.	6			6
Bridge floating mobile assault	16			16
amphib (ECAB).	16			16
Bridge floating raft sect lt tact raft	2			2
Crane shovel basic unit 20-Ton ¾ cu yd w/attachments	3	2		1
Ferry conversion set raft inf spt	2			2
Grader road MTZD dsl drvn	4	4		
Launcher M48 tank chassis trans for AVLB	4			4
Loader, scoop dsl drvn	12		3	
Pneu tool and compr outfit trlr mtd	5	1	1	
Ramp load vehicle mobile assault amph float bridge.	8			8
Shop equip contact maint trk mtd	1	1		
Shop equip organ rep light truck mtd	1	1		
Tractor full trkd low sp dsl drvn	7	3	1	
Trailer flat bed 10-Ton	2	2		
Water purif equip set 1500 GPH	5	5		
Welding shop cargo trlr mtd	1	1		
Signal Items				
Radio set AN/GRC–19	9	4	1	1
Radio set AN/GRR–5	6	1	1	1
Radio set AN/RRC–25	74	0	15	14
Radio set AN/VRC–34	2	2	0	0

Signal Items	*AGG*	*Breakdown Within Organic Units*		
		146	*147*	*148*
Radio set AN/VRC-46	22	3	4	7
Radio set AN/VRC-47	7	2	1	1
Radioteletypewriter set AN/GRC-46	1	1	0	0
Switchboard tel man SB-22/PT	2	2		
Switchboard tel man SB-993/GT	18	1	4	1

(Add) TOE 5–146

HEADQUARTERS AND HEADQUARTERS COMPANY, ARMORED DIVISION ENGINEER BATTALION

or

HEADQUARTERS AND HEADQUARTERS COMPANY, MECHANIZED DIVISION, ENGINEER BATTALION

Section A. GENERAL

1. **Mission.** *a. Headquarters.* To provide an engineer special staff section for the division and to provide command and staff for the armored division engineer battalion or mechanized division engineer battalion.

b. Headquarters Company. To provide administration, communications, reconnaissance, maintenance support, supply, medical service, and supplemental heavy equipment for the engineer battalion.

c. To undertake and carry out infantry combat missions of a headquarters and headquarters company when required.

2. **Assignment.** Organic to the armored division engineer battalion or mechanized division battalion, TOE 5–145.

3. **Capabilities.** This unit provides—

a. Staff planning and supervision of division engineer operations, including attached engineer troops.

b. Water purification and supply with five water points.

c. Engineer reconnaissance, intelligence, and operation of battalion communications system.

d. Organizational maintenance for equipment organic to the battalion.

e. Planning employment of demolitions, including ADM.

f. Additional support for the armored division and mechanized division engineer battalion, including administration, medical services, and supplemental equipment.

4. **Basis of Allocation.**	One per armored division engineer battalion or mechanized division engineer battalion, TOE 5–145.
5. **Category.**	I
6. **Mobility.**	One hundred percent.

Section B. ORGANIZATION (fig. 56)

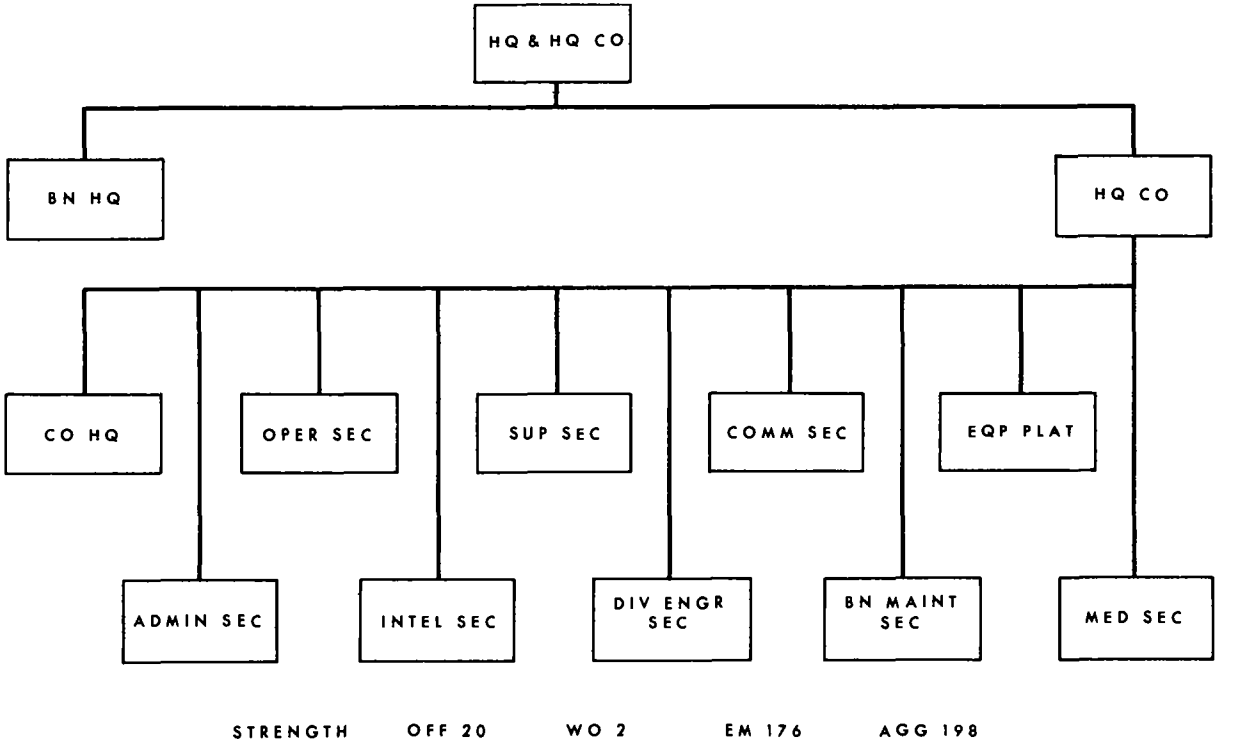


Figure 56. Organizational chart of headquarters, and headquarters company of armored division engineer battalion or mechanized division engineer battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(See Section C, TOE 5–145)

(Add) TOE 5–147

COMBAT ENGINEER COMPANY, ARMORED DIVISION ENGINEER BATTALION
or
COMBAT ENGINEER COMPANY MECHANIZED DIVISION ENGINEER BATTALION

Section A. GENERAL

1. **Mission.** *a.* To provide an operating component for the armored and mechanized divisions' engineer battalions.

b. To undertake and carry out infantry combat missions when required.

2. **Assignment.** Organic to armored division engineer battalion or mechanized division engineer battalion, TOE 5–145.

3. **Capabilities.** This unit—

a. Performs combat engineer tasks and when reinforced with additional heavy equipment can execute more complex engineer work.

b. Provides engineer support for combined arms teams of the armored and mechanized brigades.

c. Prepares for employment of and executes the firing of ADM.

4. **Basis of Allocation.**	Four per armored division engineer battalion or mechanized division engineer battalion, TOE 5–145.
5. **Category.**	I
6. **Mobility.**	One hundred percent.

Section B. ORGANIZATION (fig. 57)

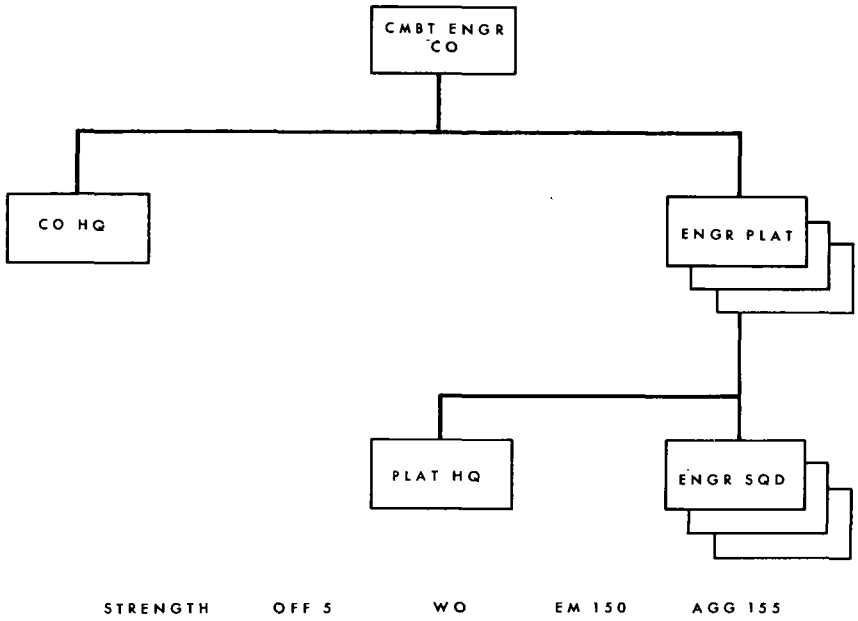


Figure 57. Organizational chart of combat engineer company, armored division engineer battalion or mechanized division engineer battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(See Section C, TOE 5–145)

(Add) TOE 5–148

BRIDGE COMPANY
ARMORED DIVISION ENGINEER BATTALION
or
INFANTRY DIVISION ENGINEER BATTALION
or
MECHANIZED DIVISION ENGINEER BATTALION

Section A. GENERAL

1. **Mission.** *a.* To provide technical personnel and equipment to load, maintain, transport, erect, and operate tactical assault stream crossing equipment.

b. To engage in non-tactical independent bridging or ferry missions when required in operation of its organic equipage.

c. To undertake and carry out infantry combat missions when required.

2. **Assignment.** Organic to armored division engineer battalion and mechanized division engineer battalion, TOE 5–145 and the infantry division engineer battalion, TOE 5–155.

3. **Capabilities.** This unit—

a. Provides equipment to erect 472 feet of mobile assault amphibious bridge or four self-propelled class 60 ferries.

b. May construct of the amphibious bridge components floating bridges or ferries in the following combinations:

(1) One 472 foot class 60 floating bridge, or
(2) Two 262 class 60 floating bridges, or
(3) Four 157 foot class 60 ferries.

c. Provides armored vehicle launched bridging equipment capable of passing class 60 loads over wet or dry gaps up to 60 feet in width for four separate assault crossings.

d. Provides light stream crossing equipage to support an infantry battalion in a river crossing when amphibious vehicles cannot be used, are not available, or river conditions preclude use of mobile amphibious bridge or ferry vehicles with the following:

(1) Assault boats (18) and reconnaissance boats (12) to carry one infantry company by waterborne assault.
(2) Light tactical bridge equipage to provide the following options:
  (*a*) Two class 12 ferries, or
  (*b*) One class 12 bridge 103 feet long.

e. Provides organizational maintenance for organic vehicles and engineer equipment.

4. Basis of Allocation.

a. One per armored division engineer battalion or mechanized division engineer battalion TOE 5–145

b. One per infantry division engineer battalion TOE 5–155.

5. Category. I

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 58)

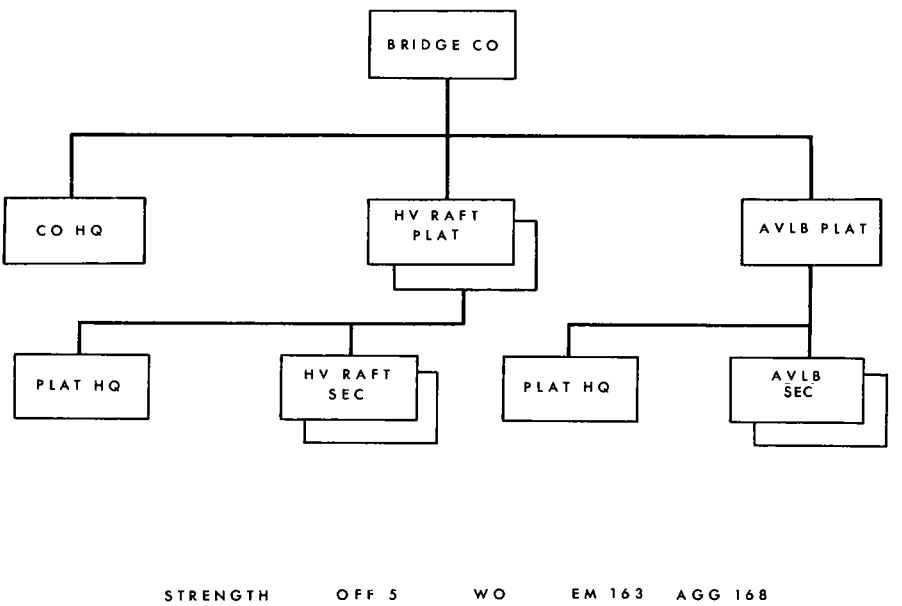


Figure 58. Organizational chart of bridge company, mechanized, armored, and infantry divisions engineer battalions.

Section C. MAJOR ITEMS OF EQUIPMENT

(See Section C, TOE 5–145)

(Add) TOE 5–155

INFANTRY DIVISION ENGINEER BATTALION

Section A. GENERAL

1. Mission. *a.* To increase the combat effectiveness of the infantry division by means of general engineer work.

b. To undertake and carry out infantry combat missions when required.

2. Assignment. Organic to infantry division, TOE 7.

3. Capabilities. This unit provides—

a. Engineer staff planning supervision for organic and attached engineer troops.

b. Construction, repair and maintenance of roads, bridges, fords, and culverts.

c. Support of hasty stream crossing operations with boats, rafts, and bridges; coordination of organic and attached engineer troops in support of deliberate stream crossings.

d. Fixed bridging for passage of short gaps.

e. Assistance in the removal of obstacles, including mines and boodytraps.

f. Asssitance in the emplacement of obstacles, including mines and boobytraps.

g. Prepares and executes demolitions, including ADM.

h. Assists other troops in preparation of fortifications and camouflage.

i. Performs engineer reconnaissance and intelligence.

j. General construction, including construction of landing strips.

k. Construction and placement of deceptive devices.

l. Organizational maintenance for equipment organic to the battalion.

m. Water purification and supply.

n. Technical advice to supported units on engineering matters, including recommendations for employment of engineer troops.

o. Assistance in assault of fortified positions.

p. Exploits locally available sources of materials for construction, fortification, and camouflage.

4. Basis of Allocation. One per infantry division, TOE 7.

5. Category. I.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 59)

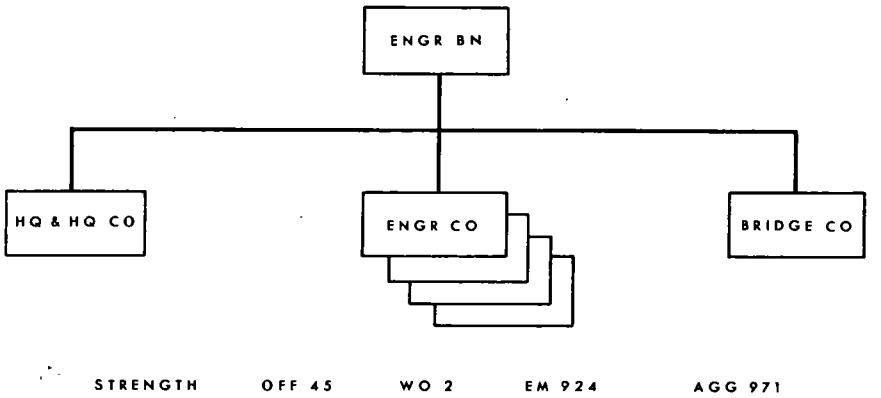


Figure 59. Organizational chart of infantry division engineer battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

	AGG	*156*	*157*	*148*
Weapons				
Gun machine 7.62 mm LW	73	9	13	12
Launcher grenade, 40 mm	48	5	9	6
Launcher rocket 3.5 inch	61	5	12	8
Vehicles				
Combat engr veh	4		1	
Semitrailer low bed 25-Ton	13	3	2	2
Semitrailer low bed 60-Ton	1			1
Tank recovery veh med	1	1		
Truck cargo ¾-Ton 4 x 4	15			
Truck cargo 2½-Ton	28	11	3	12
Truck dump 5-Ton	59	7	13	
Truck tank fuel servicing 2½-Ton	4	2		2
Truck tractor 10-Ton	14	3	2	3
Truck utility	43	17	4	9
Truck van shop 2½-Ton	1	1		
Truck wrecker med 5-Ton	1	1		
Engineer Items				
Boat landing inflat assault craft 15-man	18			18
Boat recon pneu 3-man	27	3	3	12
Bridge armored veh launch scissoring	6			6
Bridge floating mobile assault amphib (ECAB)	16			16
Bridge floating raft sec lt tact raft	2			2
Crane shovel basic unit trk mt 20-Ton ¾ cu yd	2	2		
Ferry conversion set raft inf spt	2			2

	AGG	*156*	*157*	*148*
Engineer Items				
Grader road mtzd dsl drvn	4	4		
Launcher M48 tank chassis trans for AVLB	4			4
Loader scoop dsl drvn	12		3	
Pneu tool and compr outfit	5	1	1	
Ramp load veh mobile assault amphi flt brdg	8			8
Shop equip cont maint trk mtd	1	1		
Shop equip orgn rep lt trk mtd	1	1		
Tractor full trkd low spd dsl drvn	11	3	2	
Trailer flat bed 10-Ton	2	2		
Water purification equip set, 1500 GPH	5	5		
Welding shop cargo trlr mtd	1	1		
Signal Items				
Radio set AN/GRC-19	9	4	1	1
Radio set AN/GRR-5	6	1	1	1
Radio set AN/RRC-25	74	0	15	14
Radio set AN/VRC-34	2	2	0	0
Radio set AN/VRC-46	22	3	4	7
Radio set AN/VRC-47	7	2	1	1
Radioteletypewriter set AN/GRC-46	1	1	0	0
Switchboard tel man SB-22/PT	2	2		
Switchboard tel man SB-993/GT	18	1	4	1

(Add) TOE 5–156

HEADQUARTERS AND HEADQUARTERS COMPANY INFANTRY DIVISION ENGINEER BATTALION

Section A. GENERAL

1. **Mission.** *a. Headquarters.* To provide an engineer special staff section for the division and to provide command and staff for the infantry division engineer battalion.

b. Headquarters Company. To provide administration, communications, reconnaissance, maintenance support, supply, medical service, and supplemental heavy equipment for the engineer battalion.

c. To undertake and carry out infantry combat missions of a headquarters and headquarters company when required.

2. **Assignment.** Organic to the infantry division engineer battalion, TOE 5–155.

3. **Capabilities.** This unit—

a. Staff planning and supervision of division engineer operations, including attached engineer troops.

b. Water purification and supply with five water points.

c. Engineer reconnaissance, intelligence, and operation of battalion communications system.

d. Organizational maintenance for equipment organic to the battalion.

e. Planning employment of demolitions, including ADM.

f. Additional support for the infantry division engineer battalion, including administration, medical services, and furnishing supplemental equipment.

4. **Basis of Allocation.** One per infantry division engineer battalion, TOE 5–155.

5. **Category.** I.

6. **Mobility.** One hundred percent.

Section B. ORGANIZATION (fig. 60)

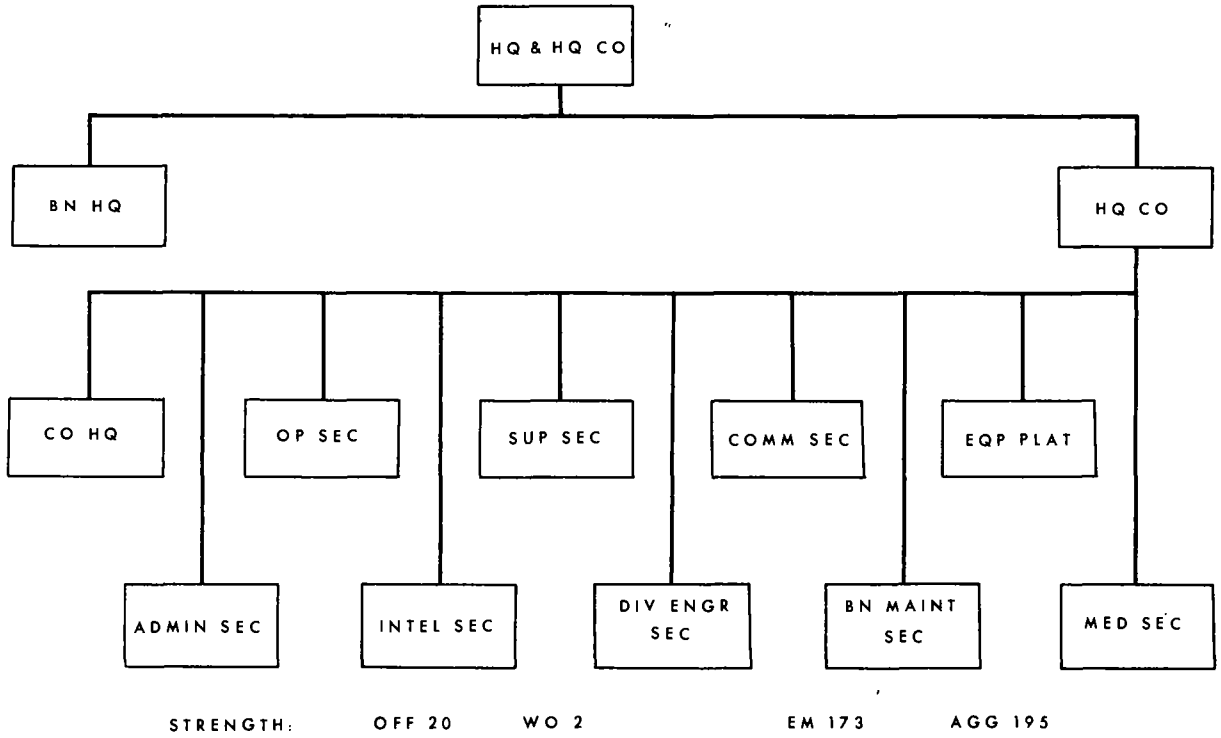


Figure 60. Organizational chart of headquarters and headquarters company, infantry division engineer battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(See Section C, TOE 5–155)

(Add) TOE 5–157

ENGINEER COMPANY INFANTRY DIVISION ENGINEER BATTALION

Section A. GENERAL

1. Mission. *a.* To provide an operating component of the infantry division engineer battalion.

b. To undertake and carry out infantry combat missions when required.

2. Assignment. Organic to the infantry division engineer battalion.

3. Capabilities. This unit—

a. Performs combat engineer tasks and when reinforced with additional heavy equipment can execute more complex engineer work.

b. Provides engineer support for combined arms teams of the infantry brigade.

c. Prepares for employment and executes the firing of ADM.

4. Basis of Allocation.	Four per infantry division engineer battalions, TOE 5–155.
5. Category.	I.
6. Mobility.	One hundred percent mobile.

Section B. ORGANIZATION (fig. 61)

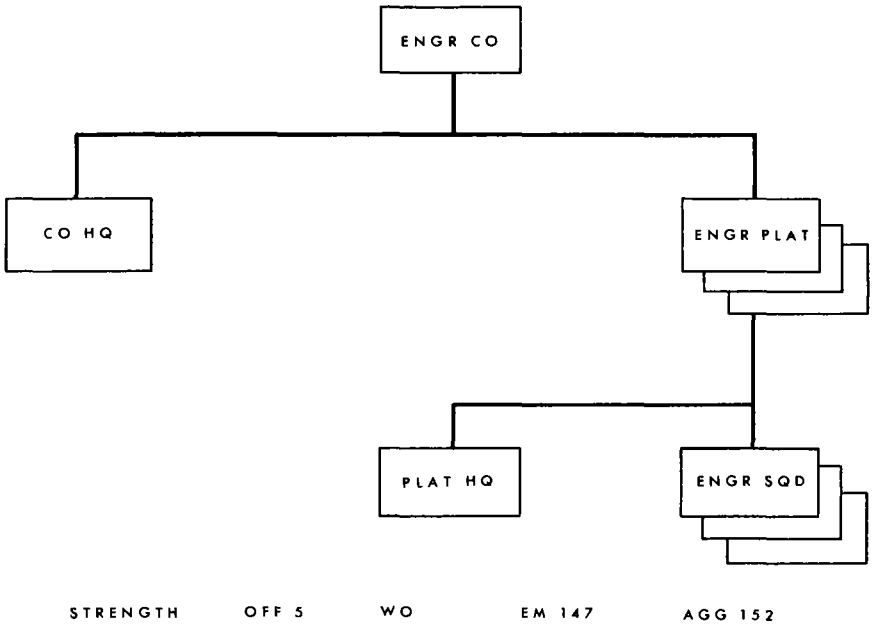


Figure 61. Organizational chart, engineer company, infantry division engineer battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(See Section C, TOE 5–155)

(Add) TOE 5–38

ENGINEER COMBAT COMPANY, UNITED STATES ARMY MISSILE COMMAND, AIR-TRANSPORTABLE

Section A. GENERAL

1. **Mission.** *a.* To provide an operating component for performance of engineer work in support of the United States Army Missile Command.

b. To perform infantry combat missions when required.

2. **Assignment.** Organic to United States Army Missile Command, air-transportable, TOE 39–51.

3. **Capabilities.** This unit—

a. Performs combat engineer missions to include heavy engineer tasks when reinforced with additional heavy equipment.

b. Purifies up to 1,200 gallons of potable water per hour, and provides storage facilities for 9,000 gallons.

c. Fields one topographic survey party to provide 2d order survey data for missile command.

d. Prepares and executes demolitions including ADM.

4. **Basis of Allocation.**	One per United States Army Missile Command, air-transportable, TOE 39–51.
5. **Category.**	I.
6. **Mobility.**	One hundred percent.

Section B. ORGANIZATION (fig. 62)

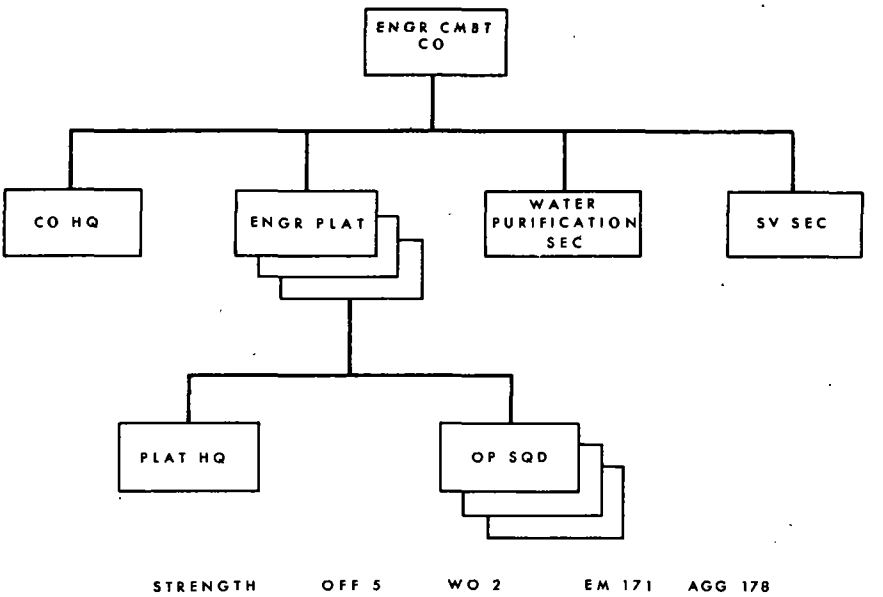


Figure 62. Organizational chart ofthe engineer combat company, United States Army Missile Command, air transportable.

Section C. MAJOR ITEMS OF EQUIPMENT

Weapons

Gun machine gun 50 cal	4
Gun machine gun 7.62 mm	6
Launcher rocket 3.5 inch	9

Vehicles

Truck cargo 2½-Ton	5
Truck dump 2½-Ton	12
Truck tractor 5-Ton	2
Truck utility	5

Engineer Items

Grader road mtzd dsl drvn	1
Loader scoop 1½ cu yd dsl drvn	1
Pneu tool and compr outfit	1
Tellurometer master unit	1
Tellurometer remote unit	2
Tractor full tracked low sp med	2
Water purification equipment 600 GPH	2

Signal Items

Radio set AN/PRC–25	9
Radio set AN/VRC–34	1
Radio set AN/VRC–46	4
Switchboard tel man SB-993/GT	1

(Add) TOE 5–25

AIRBORNE DIVISION ENGINEER BATTALION

Section A. GENERAL

1. Mission. *a.* To increase the combat effectiveness of the airborne division by combat support and general engineer work.

b. To undertake and carry out airborne infantry combat missions when required.

2. Assignment. Organic to airbrone division, TOE 57.

3. Capabilities. This unit—

a. Provides engineer staff planning and supervision for organic and attached troops.

b. Performs engineer reconnaissance and intelligence.

c. Performs construction, repair and maintenance roads, bridges, fords, and culverts to facilitiate the movements of the division.

d. Performs general construction, including construction of assault landing strips.

e. Prepares and executes demolitions including ADM.

f. Provides personnel and equipment for purification and supply of water.

g. Lands by parachute and aircraft.

h. Provides support of hasty and deliberate stream crossing operations through coordination of attached engineer bridge units and employment of class IV bridge equipment.

i. Provides technical assistance in special camouflage matters.

j. Assists with removal and emplacement of obstacles, including mines and boobytraps.

k. Provides fixed bridging for passage of short gaps.

l. Performs construction and placement of deceptive devices.

m. Performs organizational maintenance for equipment organic to the battalion.

n. Provides technical advice to supported units on engineering matters, including recommendations for employment of engineer troops.

o. Assists in assault of fortified positions.

p. Exploits locally available sources of materials for construction, fortifications and camouflage.

4. Basis of Allocation. One per airborne division, TOE 57.

5. Category. I.

6. Mobility. One hundred percent.

Section B. ORGANIZATION (fig. 63)

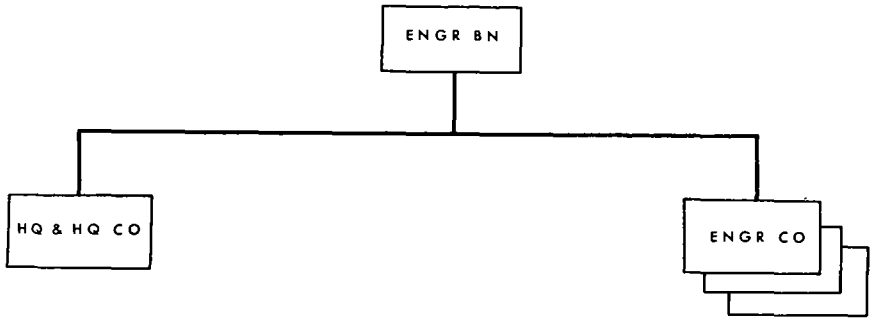


Figure 63. Organizational chart airborne division engineer battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

	AGG	*5-26*	*5-27*
Weapons			
Gun machine 7.62 mm LW	48	9	13
Launcher grenade 40 mm	59	5	18
Launcher rocket 3.5 inch	41	5	12
Vehicles			
Truck cargo ¾-Ton	20	11	3
Truck cargo 2½-Ton	6	3	1
Truck dump 2½-Ton	47	8	13
Truck tank fuel service 2½-Ton	1	1	
Truck utility	26	14	4
Truck van shop 2½-Ton	1	1	
Truck wrecker light 2½-Ton	1	1	
Engineer Equipment			
Boat recon pneu 3-man	12	3	3
Crane shovel 7 Ton ½ cu yd	2	2	
Grader road mtzd dsl drvn	4	4	
Loader scoop dsl drvn 1½ cu yd	9	----------	3
Pneu tool and compr outfit	4	1	1
Shop equip contact mt trk mtd	1	1	
Shop equip organ rep lt trk mtd	1	1	
Tractor full trkd air-trans	6	3	1
Tractor whld air-trans	6	3	1
Water purification equip 600 GPH	4	4	
Welding shop cargo trlr mtd	1	1	

	AGG	5-26	5-27
Signal Items			
Radio set AN/GRR-5	4	1	1
Radio set AN/GRC-19	7	3	1
Radio set AN/PRC-25	9	0	3
Radio set AN/VRC-34	2	2	0
Radio set AN/VRC-46	15	3	4
Radio set AN/VRC-47	5	2	1
Switchboard tel man SB-22/PT	2	2	
Switchboard tel man SB-993/GT	13	1	4

HEADQUARTERS AND HEADQUARTERS COMPANY AIRBORNE DIVISION ENGINEER BATTALION

Section A. GENERAL

1. **Mission.** *a. Headquarters.* To provide an engineer special staff section for the division and to provide command and staff for the airborne division engineer battalion.

b. Headquarters Company. To provide administration, communications, reconnaissance, maintenance support, supply, medical service and supplemental heavy equipment for the engineer battalion.

c. Purpose. To undertake and carry out air borne infantry combat missions of a headquarters and headquarters company, when required.

2. **Assignment.** Organic to the airborne division engineer battalion, TOE 5–25.

3. **Capabilities.** This unit—

a. Performs staff planning and supervision of engineer operations within the division, including that required for the operations of attached troops.

b. Performs engineer reconaissance and intelligence functions and operation of battalion communications system.

c. Provides four water points.

d. Prepares and executes demolitions including ADM.

e. Provides unit level medical service to include medical care and evacuation for the airborne division engineer battalion, establishing an aid station, and furnishing aid men to battalion units.

f. Provides organizational maintenance for equipment organic to the battalion.

g. Provides additional support for the airborne division engineer battalion to include administration and furnishing supplemental equipment.

4. **Basis of Allocation.** One per airborne division engineer battalion, TOE 5–25.

5. **Category.** I.

6. **Mobility.** One hundred percent.

Section B. ORGANIZATION (fig. 64)

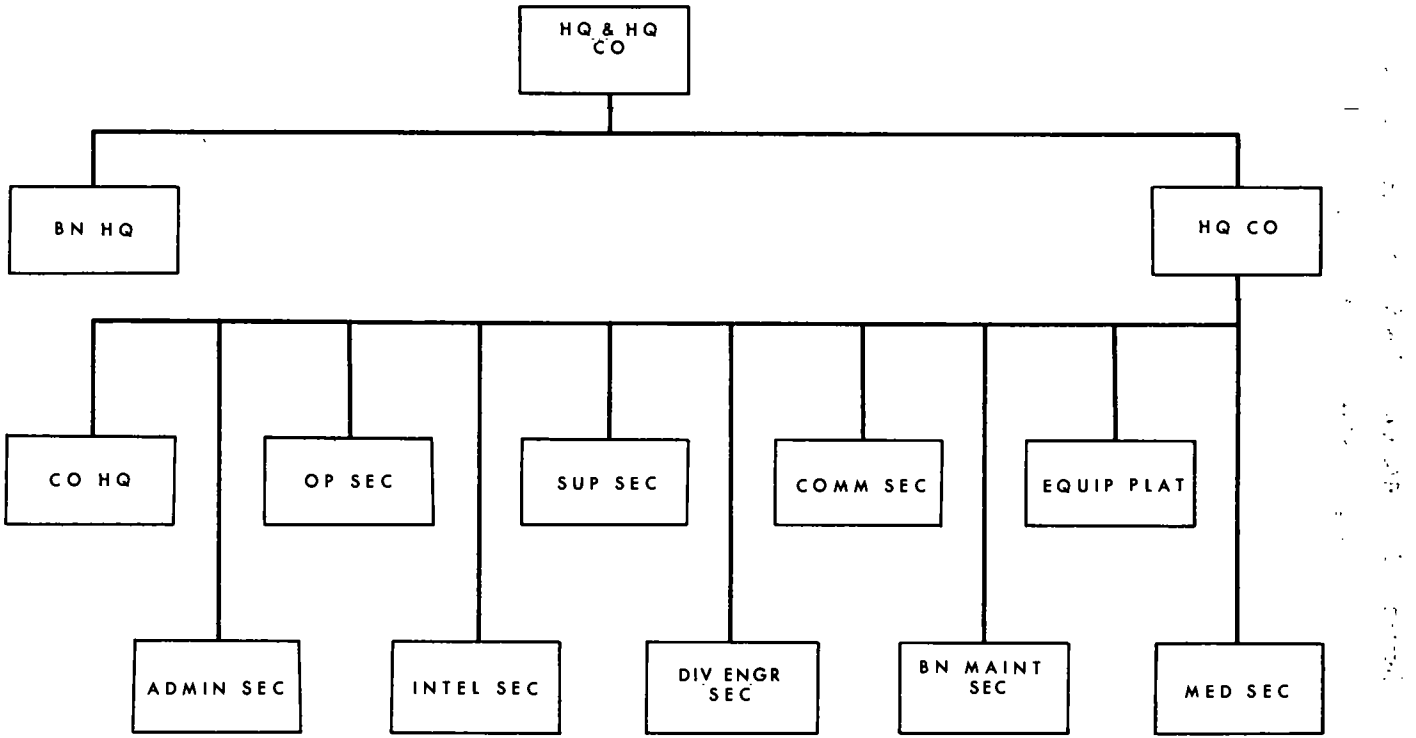


Figure 64. Organizational chart of headquarters and headquarters company, airborne division engineer battalion.

Section C. MAJOR ITEMS OF EQUIPMENT

(See Section C, TOE 5–25)

(Add) TOE 5–27

ENGINEER COMPANY AIRBORNE DIVISION ENGINEER BATTALION

Section A. GENERAL

1. **Mission.** *a.* To provide an operating component of the airborne division engineer battalion.

b. To undertake and carry out airborne infantry combat missions when required.

2. **Assignment.** Organic to the airborne division engineer battalion, TOE 5–25.

3. **Capabilities.** This unit—

a. Performs combat engineer tasks and when reinforced with additional heavy engineer equipment can execute more complex engineer work to include construction of assault aircraft landing facilities.

b. Provides engineer support for combined arms teams of the airborne infantry brigade.

c. Perpares for employment and executes the firing of ADM.

4. **Basis of Allocation.** Three per airborne division engineer battalion, TOE 5–25.

5. **Category.** I.

6. **Mobility.** One hundred percent mobile.

Section B. ORGANIZATION (fig. 65)

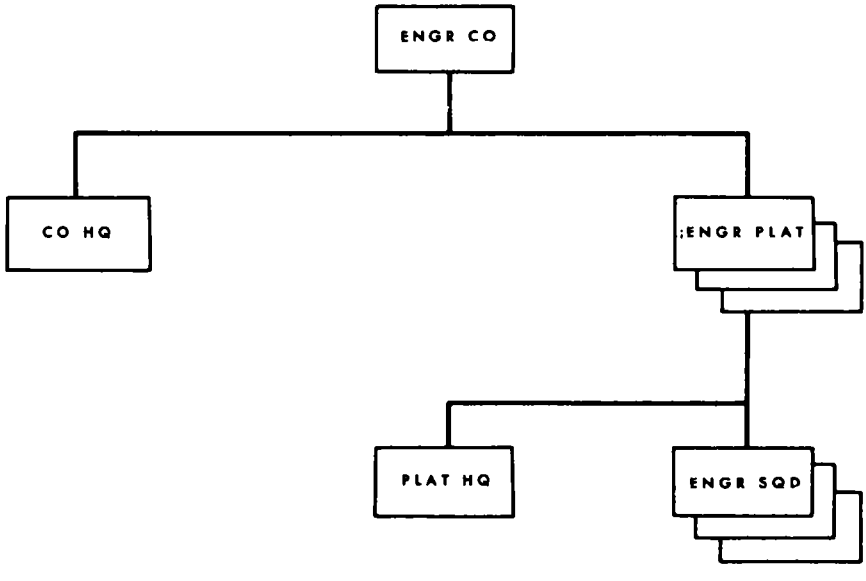


Figure 65. Organizational chart of engineer company airborne division engineer battalion.

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Chief of Staff.

Official:

J. C. LAMBERT,
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USA Engr Cen (20)
AMS (10)
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NG: None.

USAR: Same as active Army except allowance is one copy to each unit.

For explanation of abbreviations used, see AR 320–50.

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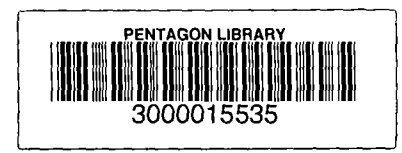
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